INCH-POUND

MIL-M-38510/122A
15 September 1989
SUPERSEDING
MIL-M-38510/122
9 April 1980

MILITARY SPECIFICATION

MICROCIRCUITS, LINEAR, HIGH SLEW RATE OPERATIONAL AMPLIFIERS, MONOLITHIC SILICON

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the detail requirements for monolithic silicon, operational amplifiers. Two product assurance classes and a choice of case outline and lead finish are provided for each type and are reflected in the complete Part or Identifying Number (PIN) (see 6.6).

1.2 Classification.

1.2.1 Device types. The device types shall be as follows:

Device type	Circuit
01	Single operational amplifier, internally compensated, low power, high performance
02	Single operational amplifier, internally compensated, high impedance, wide band
03	Single operational amplifier, externally compensated, high impedance, wide band
04	Single operational amplifier, internally compensated, precision, high slew rate
05	Single operational amplifier, internally compensated, high slew rate
06	Single operational amplifier, externally compensated, high slew rate
07	Single operational amplifier, internally compensated, high speed, precision
08	Single operational amplifier, internally compensated, high speed, fast-settling, precision

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: NASA Part Project Office, Code 311.A NASA/Goddard Space Flight Center, Greenbelt, MD 20771, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5962

1.2.2 Device class. The device class shall be the product assurance level as defined in MIL-M-38510.

1.2.3 Case outlines. The case outlines shall be designated as follows:

Outline letter	Case outline (see MIL-M-38510, appendix C)
G	A-1 (8-lead, .370" x .185"), can package
H	F-4 (10-lead, .290" x .260" x .085"), flat package (device types 01, 02, and 03 only)
P	D-4 (8-lead, .405" x .310" x .200"), dual-in-line package (device types 02, 03, 04, 05, 06, 07, and 08 only)
2	C-2 (20-terminal, .358" x .358" x .100"), square chip carrier package (device types 07 and 08 only)

1.3 Absolute maximum ratings.

Supply voltage range	±20 V dc 1/
Input voltage range	±15 V dc 2/ 3/
Differential input voltage range: 2/ 3/	
Device type 01	±18 V dc
Device types 02 and 03	±12 V dc
Device types 04, 05, and 06	±15 V dc
Device types 07 and 08	±20 V dc
Storage temperature range	-65°C to +125°C
Lead temperature (soldering, 10 seconds)	+300°C
Junction temperature (T_J)	+175°C

1.4 Recommended operating conditions.

Supply voltage range	±15 V dc
Ambient temperature range	-55°C to +125°C

1.5 Power and thermal characteristics.

Package	Case outline	Maximum allowable power dissipation	Maximum θ_{JC}	Maximum θ_{JA}
8-lead can	G	300 mW at T_A = +125°C	40°C/W	150°C/W
10-lead flat package	H	300 mW at T_A = +125°C	45°C/W	150°C/W
8-lead dual-in-line	P	500 mW at T_A = +125°C	26°C/W	119°C/W
20-terminal square chip carrier	2	500 mW at T_A = +125°C	30°C/W	120°C/W

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

1/ Voltages in excess of these may be applied for short term tests if voltage difference does not exceed 40 volts.

2/ For supply voltages less than ±15 V dc, the absolute maximum input voltage is equal to the supply voltage (minus 3 volts for device types 01, 02, and 03).

3/ For supply voltages less than ±20 V, the absolute maximum input voltage is equal to the supply voltage for device types 07 and 08.

SPECIFICATION

MILITARY

MIL-M-38510 - Microcircuits, General Specification for.

STANDARD

MILITARY

MIL-STD-883 - Test Methods and Procedures for Microelectronics.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.2 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets, or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Detail specification. The individual item requirements shall be in accordance with MIL-M-38510, and as specified herein.

3.2 Design, construction, and physical dimensions. The design, construction, and physical dimensions shall be as specified in MIL-M-38510 and herein.

3.2.1 Terminal connections. The terminal connections shall be as specified on figure 1.

3.2.2 Schematic circuits. The schematic circuits shall be as specified on figure 2 and shall be submitted to this preparing activity prior to inclusion of a manufacturer's device in this specification and shall be submitted to the qualifying activity and agent activity (DESC-ECS) as a prerequisite for qualification. All qualified manufacturers' schematics shall be maintained by the agent activity and will be available upon request.

3.2.3 Case outlines. The case outlines shall be as specified in 1.2.3.

3.2.4 Package and sealing material. Package and sealing material shall be in accordance with MIL-M-38510.

3.3 Lead material and finish. The lead material and finish shall be in accordance with MIL-M-38510 (see 6.4).

3.4 Electrical performance characteristics. The following electrical performance characteristics apply over the full operating ambient temperature range of -55°C to +125°C and for supply voltages of ±15 V dc, unless otherwise specified (see table I).

3.4.1 Offset null circuit. Each amplifier having nulling inputs shall be capable of being nulled 1 millivolt beyond 0.0 volt at $-55°C \leq T_A \leq +125°C$ using the circuit on figure 3.

3.4.2 Frequency compensation. Device types 01, 02, 04, 05, and 08 shall be free of oscillation when operated in a unity gain noninverting mode with no external compensation and a source resistance of ≤ 10 kilohms, and when operated in any test condition specified herein. Device type 03 shall be free of oscillation when operated in a closed loop gain of 5 or greater with no external compensation. Device type 07 shall be free of oscillation when operated in a closed loop gain of 3 or greater with no external compensation.

3.4.3 Output short circuit current test. Output short circuit current test (I_{OS}) shall not be performed on any device types. Current density requirements of MIL-M-38510 junction temperature (T_J) or both are exceeded under output short circuit conditions.

3.5 Electrical test requirements. The electrical test requirements shall be as specified in table II. The subgroups of table III which constitute the minimum electrical test requirements for screening, qualification, and quality conformance by device class are specified in table II.

3.6 Marking. Marking shall be in accordance with MIL-M-38510.

3.6.1 Serialization. All class S devices shall be serialized in accordance with MIL-M-38510.

3.6.2 Correctness of indexing and marking. All devices shall be subjected to the final electrical tests specified in table II after part marking to verify that they are correctly indexed and identified by PIN. Optionally, an approved electrical test may be devised especially for this requirement.

3.7 Microcircuit group assignment. The devices covered by this specification shall be in microcircuit group number 49 (see MIL-M-38510, appendix E).

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling and inspection. Sampling and inspection procedures shall be in accordance with MIL-M-38510 and methods 5005 and 5007, as applicable, of MIL-STD-883, except as modified herein.

4.2 Screening. Screening shall be in accordance with method 5004 of MIL-STD-883, and shall be conducted on all devices prior to qualification and quality conformance inspection. The following additional criteria shall apply:

a. Burn-in test (method 1015 of MIL-STD-883), for class S and B devices; test condition A, C, or F using the circuit shown on figure 4, or test condition D using the circuit shown on figure 5.

b. Interim and final electrical test parameters shall be as specified in table II, except interim electrical parameter tests prior to burn-in are optional at the discretion of the manufacturer.

c. The percent defective allowable (PDA): The PDA for class S and class B devices shall be as specified in MIL-M-38510, based on failures from group A, subgroup 1 test after cooldown as final electrical test in accordance with method 5004 of MIL-STD-883, and with no intervening electrical measurements. If interim electrical parameter tests are performed prior to burn-in, failures resulting from pre burn-in screening may be excluded from the PDA. If interim electrical parameter tests prior to burn-in are omitted, then all screening failures shall be included in the PDA. The verified failures of group A, subgroup 1 after burn-in divided by the total number of devices submitted for burn-in that lot shall be used to determine the percent defective for that lot, and the lot shall be accepted or rejected based on the PDA for the applicable device class.

4.3 Qualification inspection. Qualification inspection shall be in accordance with MIL-M-38510. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4).

4.4 Quality conformance inspection. Quality conformance inspection shall be in accordance with MIL-M-38510 and as specified herein. Inspections to be performed shall be those specified in method 5005 of MIL-STD-883 and herein for groups A, B, C, and D inspections (see 4.4.1 through 4.4.4).

4.4.1 Group A inspection. Group A inspection shall be in accordance with table I of method 5005 of MIL-STD-883 and as follows:

a. Electrical test requirements shall be as specified in table II herein.

b. Subgroups 9, 10, and 11 shall be omitted.

c. Subgroup 12 shall be added to group A inspection as specified in table III herein. The acceptable sample number for subgroup 12 shall be 15 with 0 failures for all classes.

d. The acceptable sample number for subgroup 13 shall be 32 devices with 0 failures. If the input offset voltage and current temperature sensitivities (computed from group A, subgroups 1, 2, and 3 data) indicate a failure (one device) out of an acceptable sample number of 32 devices for subgroup 13, the lot shall be 100 percent electrically retested for the parameters in subgroup 13, and all temperature sensitive rejects shall be removed. No re-sampling of the lot is required if the original sample passed the other group A tests.

4.4.2 Group B inspection. Group B inspection shall be in accordance with table II of method 5005 of MIL-STD-883 and as follows:

a. Electrical parameters shall be as specified in table II herein. For class S devices, delta limits shall apply only to subgroup 5 of group B inspection.

b. Steady-state life test for class S devices shall be in accordance with table IIa of method 5005 of MIL-STD-883, using the circuit shown on figure 4. If the alternate burn-in conditions are used, the circuit shown on figure 4 shall be used.

4.4.3 Group C inspection. Group C inspection shall be in accordance with table III of method 5005 of MIL-STD-883 and as follows:

a. End-point electrical parameters shall be as specified in table II herein. Delta limits shall apply only to subgroup 1 of group C inspection for class B devices.

b. Steady-state life test (method 1005 of MIL-STD-883) for class B devices; test condition A, C, or F using the circuit shown on figure 4, or test condition D using the circuit shown on figure 5.

TABLE I. Electrical performance characteristics.

Test	Symbol	Conditions (see 3.4 and figure 6, unless otherwise specified)		Device type 1/	Limits Min	Limits Max	Unit
Input offset voltage 2/	V_{IO}	R_S = 100Ω	T_A = +25°C	01	-3.0	3.0	mV
				02,03	-4.0	4.0	
				04	-5.0	5.0	
				05,06	-8.0	8.0	
				07,08	-1.0	+1.0	
			-55°C ≤ T_A ≤ +125°C	01	-5.0	5.0	
				02,03	-6.0	6.0	
				04	-8.0	8.0	
				05,06	-10.0	10.0	
				07,08	-2.0	+2.0	
Input offset voltage	V_{IO}	T_A = +25°C (end-point limits) 3/		07,08	-1.5	+1.5	
Input offset voltage temperature sensitivity	$\Delta V_{IO} / \Delta T$	ΔT_A from -55°C to +25°C		01,02,03	-15.0	15.0	µV/°C
				04,05,06	-30.0	30.0	
				07,08	-10	+10	
		ΔT_A from +25°C to +125°C		01,02,03	-15.0	15.0	
				04,05,06	-30.0	30.0	
				07,08	-10	+10	
Input offset current 2/ 4/	I_{IO}	T_A = +25°C		01,02	-10.0	10.0	nA
				03	-15.0	15.0	
				04,05,06	-25.0	25.0	
				07,08	-.04	+.04	
		-55°C ≤ T_A ≤ +125°C		01,02,03	-30.0	30.0	
				04,05,06	-50.0	50.0	
				07,08	-1.0	+1.0	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions (see 3.4 and figure 6, unless otherwise specified)	Device type 1/	Limits Min	Limits Max	Unit
Input offset current temperature sensitivity 5/	$\Delta I_{IO} / \Delta T$	ΔT_A from -55°C to +25°C	01	-200.0	200.0	pA/°C
			02,03	-100.0	100.0	
			04,05,06	-400.0	400.0	
			07,08	-20	+20	
		ΔT_A from +25°C to +125°C	01,02,03	-100.0	100.0	
			04,05,06	-400.0	400.0	
			07,08	-20	+20	
Input bias current 2/ 4/	$+I_{IB}$	T_A = +25°C	01	-20.0	20.0	nA
			02	-10.0	10.0	
			03	-15.0	15.0	
			04,05,06	1.0	200.0	
			07,08	-.2	+.2	
		-55°C $\leq T_A \leq$ +125°C	01	-50.0	50.0	
			02,03	-30.0	30.0	
			04,05,06	1.0	400.0	
			07,08	-20	+20	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions (see 3.4 and figure 6, unless otherwise specified)	Device type 1/	Limits Min	Limits Max	Unit
Input bias current 2/ 4/	$-I_{IB}$	T_A = +25°C	01	-20.0	20.0	nA
			02	-10.0	10.0	
			03	-15.0	15.0	
			04,05,06	1.0	200.0	
			07,08	-.2	+.2	
		-55°C ≤ T_A ≤ +125°C	01	-50.0	50.0	
			02,03	-30.0	30.0	
			04,05,06	1.0	400.0	
			07,08	-20	+20	
Input bias current	$\pm I_{IB}$	T_A = +25°C (end-point limits) 3/	07,08	-1.0	+1.0	
Power supply rejection ratio	+PSRR	$+V_{CC}$ = 10 V, 20 V	01	86		dB
			02, 03, 04,05,06	80		
			07,08	84		
	-PSRR	$-V_{CC}$ = -10 V, -20 V	01	86		
			02,03, 04,05,06	80		
			07,08	84		
Input voltage common mode rejection ratio	CMRR	$+V_{CC}$ = 5 V, 25 V $-V_{CC}$ = -25 V, -5 V	01	86		
			02,03,04, 05,06,08	80		
			07	84		

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions (see 3.4 and figure 6, unless otherwise specified)		Device type 1/	Limits Min	Limits Max	Unit
Input offset voltage adjustment 6/ 7/	$+V_{IO}$ (ADJ)	T_A = +25°C		01	4.0		mV
				02,03	5.0		
				04	6.0		
				05,06	9.0		
				07,08	2.5		
		-55°C ≤ T_A ≤ +125°C		01	6.0		
				02,03	7.0		
				04	9.0		
				05,06	11.0		
				07,08	3.0		
Input offset voltage adjustment 6/ 7/	$-V_{IO}$ (ADJ)	T_A = +25°C		01		-4.0	
				02,03		-5.0	
				04		-6.0	
				05,06		-9.0	
				07,08		-2.5	
		-55°C ≤ T_A ≤ +125°C		01		-6.0	
				02,03		-7.0	
				04		-9.0	
				05,06		-11.0	
				07,08		-3.0	
Supply current 2/	I_{CC}	$\pm V_{CC}$ = ±15.0 V	T_A = +25°C	01		.15	mA
				02,03		3.7	
				04,05,06,08		6.0	
				07		7.5	
			-55°C ≤ T_A ≤ +125°C	01		.20	
				02,03		4.0	
				04,05,06		6.5	
				07		7.5	
				08		6.0	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions (see 3.4 and figure 6, unless otherwise specified)		Device type 1/	Limits Min	Limits Max	Unit
Output voltage at minimum rated output current	$+V_{OUT}$	V_{OUT} at -10 mA	T_A = +25°C	All	10.0		V
		V_{OUT} at -5 mA	-55°C ≤ T_A ≤ +125°C	01,04, 05,06, 07,08	10.0		
		V_{OUT} at -10 mA		02,03	10.0		
	$-V_{OUT}$	V_{OUT} at 10 mA	T_A = +25°C	All		-10.0	
		V_{OUT} at 5 mA	-55°C ≤ T_A ≤ +125°C	01,04, 05,06, 07,08		-10.0	
		V_{OUT} at 10 mA		02,03		-10.0	
Output voltage swing	$+V_{OP}$	R_L = 2 kΩ	T_A = +25°C	01	12.0		
				02,03, 04,05,06	10.0		
				07,08	11.5		
			-55°C ≤ T_A ≤ +125°C	01,07,08	11.0		
				02,03, 04,05,06	10.0		
	$-V_{OP}$	R_L = 2 kΩ	T_A = +25°C	01		-12.0	
				02,03, 04,05,06		-10.0	
				07,08		-11.5	
			-55°C ≤ T_A ≤ +125°C	01,07,08		-11.0	
				02,03, 04,05,06		-10.0	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions (see 3.4 and figure 6, unless otherwise specified)			Device type 1/	Limits Min	Limits Max	Unit
Open loop voltage gain 6/	+A_{VS} and -A_{VS}	V_{OUT} = ±10 V, 0 V; R_L = 2 kΩ	T_A = +25°C		01	200.0		V/mV
					02,03, 07,08	100.0		
					04	20.0		
					05,06	10.0		
			-55°C ≤ T_A ≤ +125°C		01	100.0		
					02,03, 07,08	70.0		
					04	15.0		
					05,06	7.50		
Slew rate	+SR and -SR	See figure 6	T_A = +25°C	A_V = 5	01	10.0		V/µs
				A_V = 1	02	4.0		
				A_V = 5	03	25.0		
				A_V = 1	04	25.0		
				A_V = 1	05	50.0		
				A_V = 3	06,07	100.0		
				A_V = 1	08	45.0		
			-55°C ≤ T_A ≤ +125°C	A_V = 5	01	8.0		
				A_V = 1	02	3.0		
				A_V = 5	03	20.0		
				A_V = 1	04	20.0		
				A_V = 1	05	45.0		
				A_V = 3	06	84.0		
				A_V = 3	07	80.0		
				A_V = 1	08	40.0		
Transient response: Rise time and fall time	TR(tr) and TR(tf)	See figure 6	T_A = +25°C		01			ns
				A_V = 1	02		60.0	
				A_V = 5	03		45.0	
				A_V = 1	04,05		50.0	
				A_V = 3	06,07		50.0	
				A_V = 1	08		50.0	

See footnotes at end of table.

TABLE I. Electrical performance characteristics - Continued.

Test	Symbol	Conditions (see 3.4 and figure 6, unless otherwise specified)			Device type 1/	Limits Min	Limits Max	Unit
Transient response: Rise time and fall time	$TR_{(tr)}$ and $TR_{(tf)}$	See figure 6	$-55^{\circ}C \leq T_A \leq +125^{\circ}C$		01			ns
				$A_V = 1$	02		70.0	
				$A_V = 5$	03		60.0	
				$A_V = 1$	04,05		60.0	
				$A_V = 3$	06,07		55.0	
				$A_V = 1$	08		60.0	
Transient response: Overshoot	$TR_{(+OS)}$ and $TR_{(-OS)}$	See figure 6	$T_A = +25^{\circ}C$		01			%
				$A_V = 1$	02,08		40.0	
				$A_V = 5$	03		70.0	
				$A_V = 1$	04,05		40.0	
				$A_V = 3$	06,07		40.0	
			$-55^{\circ}C \leq T_A \leq +125^{\circ}C$		01			
				$A_V = 1$	02,08		50.0	
				$A_V = 5$	03		70.0	
				$A_V = 1$	04,05		50.0	
				$A_V = 3$	06,07		45.0	
Settling time	$+t_s$ and $-t_s$	See figure 7	$T_A = +25^{\circ}C$		01			µs
				$A_V = 1$	02		4.0	
				$A_V = 5$	03		3.0	
				$A_V = 1$	04		1.2	
				$A_V = 1$	05		1.0	
				$A_V = 3$	06,07		1.1	
				$A_V = 1$	08		1.1	

1/ Device type 06 shall be free of oscillation when operated at gains of 3 or greater with no external compensation.

2/ Tests at common mode $V_{CM} = 0$, $V_{CM} = -10$ V, and $V_{CM} = +10$ V.

3/ See table IV for end-point test conditions.

4/ Device type 07 is not tested at $T_A = -55^{\circ}C$.

5/ Input offset current temperature sensitivity is guaranteed by I_{IO} end-point limits at $T_A = -55^{\circ}C$ and $+125^{\circ}C$.

6/ Note that gain is not specified at $V_{IO(ADJ)}$ extremes. Some gain reduction is usually seen at $V_{IO(ADJ)}$ extremes. For closed loop application (closed loop gain less than 1,000), the open loop tests (A_{VS}) prescribed herein should guarantee a positive, reasonably linear, transfer characteristic. They do not, however, guarantee that the open loop is linear, or even positive, over the operating range. If either of these requirements exist (positive open loop gain or open loop gain linearity), they should be specified in the contract or purchase order as additional requirements (see 6.2).

7/ The limits specified are for devices with offset voltages equal to the maximum limit. For devices with offset voltages less than the limit, offset adjust capability will be tested to guarantee adjustability to 1 millivolt beyond zero.

TABLE II. Electrical test requirements.

MIL-STD-883 test requirements	Subgroups (see table III)	
	Class S devices	Class B devices
Interim electrical parameters (method 5004)	1	1
Final electrical test parameters (method 5004)	1*,2,3,4	1*,2,3,4
Group A test requirements (method 5005)	1,2,3,4,5, 6,7,8,12,13	1,2,3,4,5, 6,7,8,12,13
Group C end-point and group B, class S electrical parameters (method 5005)	1,2,3 and table IV delta limits	1 and table IV delta limits
Group D end-point electrical parameters (method 5005)	1,2,3	1

*PDA applies to subgroup 1 (see 4.2c).

4.4.4 Group D inspection. Group D inspection shall be in accordance with table IV of method 5005 of MIL-STD-883. End-point electrical parameters shall be as specified in table II herein.

4.5 Methods of inspection. Methods of inspection shall be as specified in the appropriate tables. Electrical test circuits as prescribed herein or in the referenced test methods of MIL-STD-883 shall be acceptable. Other test circuits shall require the approval of the qualifying activity.

4.5.1 Voltage and current. All voltage values given are referenced to the external zero reference level of the supply voltage. Current values given are for conventional current and are positive when flowing into the referenced terminal.

4.5.2 Life test cooldown procedure. When devices are measured at +25°C following application of the steady-state life or burn-in test condition, they shall be cooled to within +10°C of their power stable condition at room temperature prior to removal of the bias.

4.6 Inspection of packaging. Inspection of packaging shall be in accordance with MIL-M-38510.

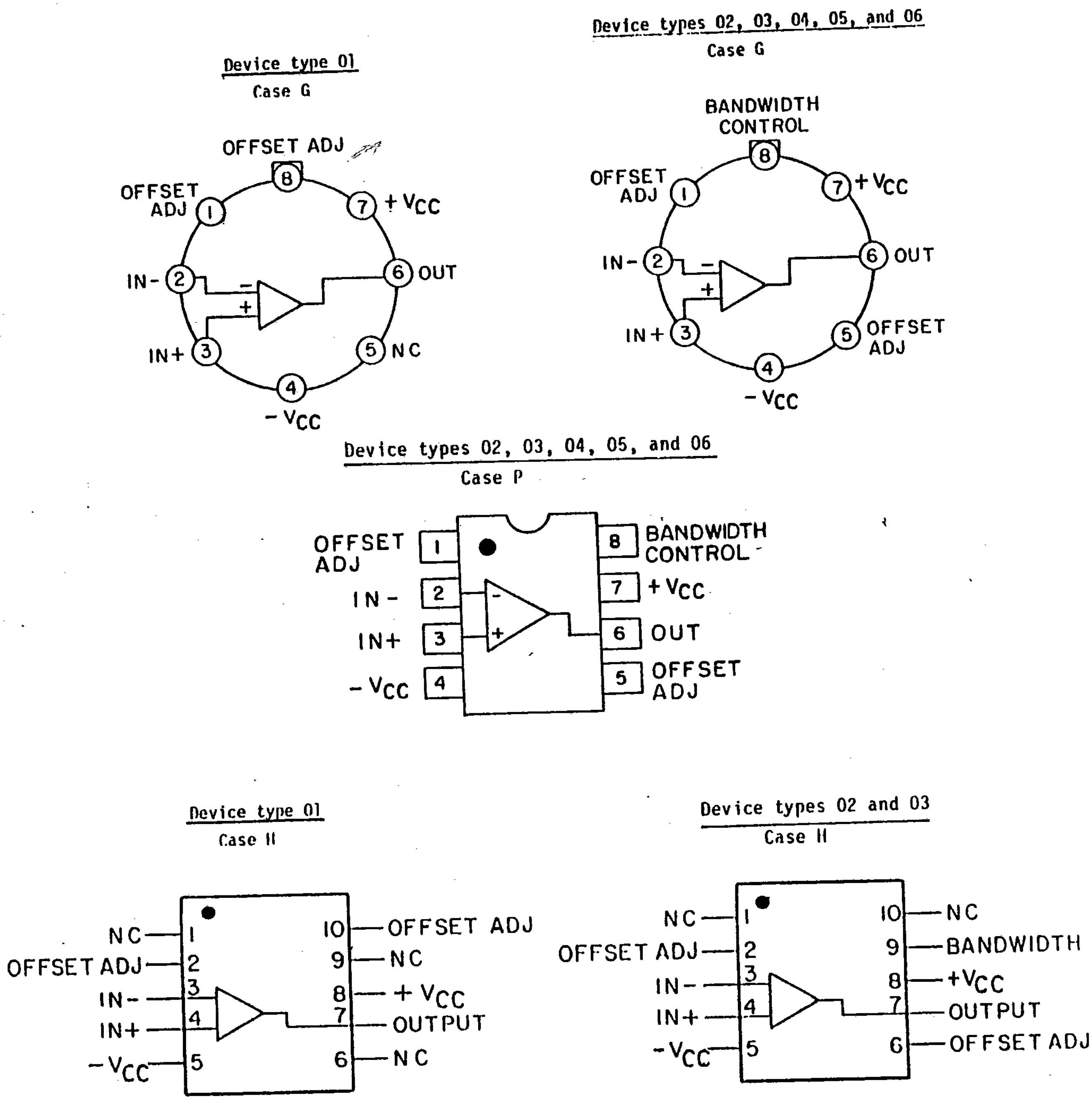
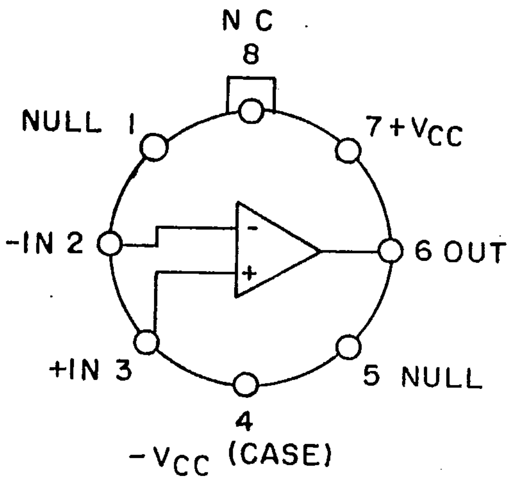


FIGURE 1. Terminal connections.

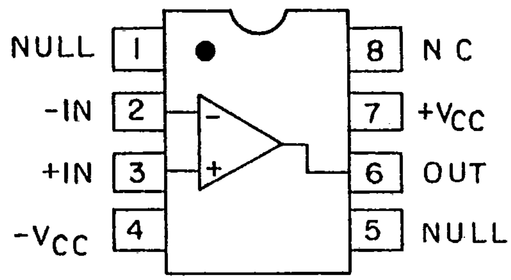
Device types 07 and 08

Case G



Device types 07 and 08

Case P



Device types 07 and 08

Case 2

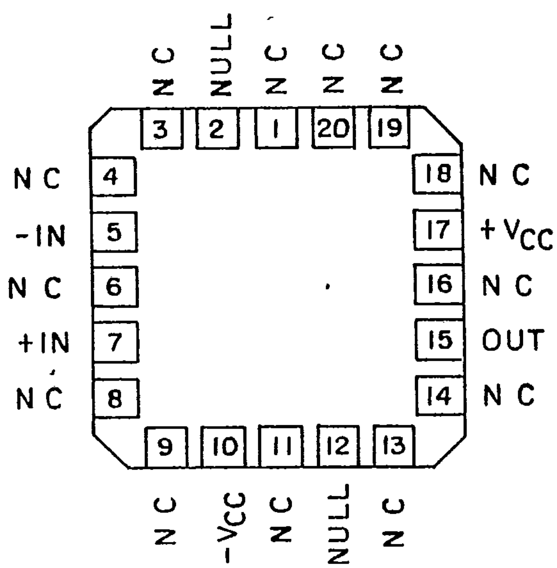


FIGURE 1. Terminal connections - Continued.

Device type 01

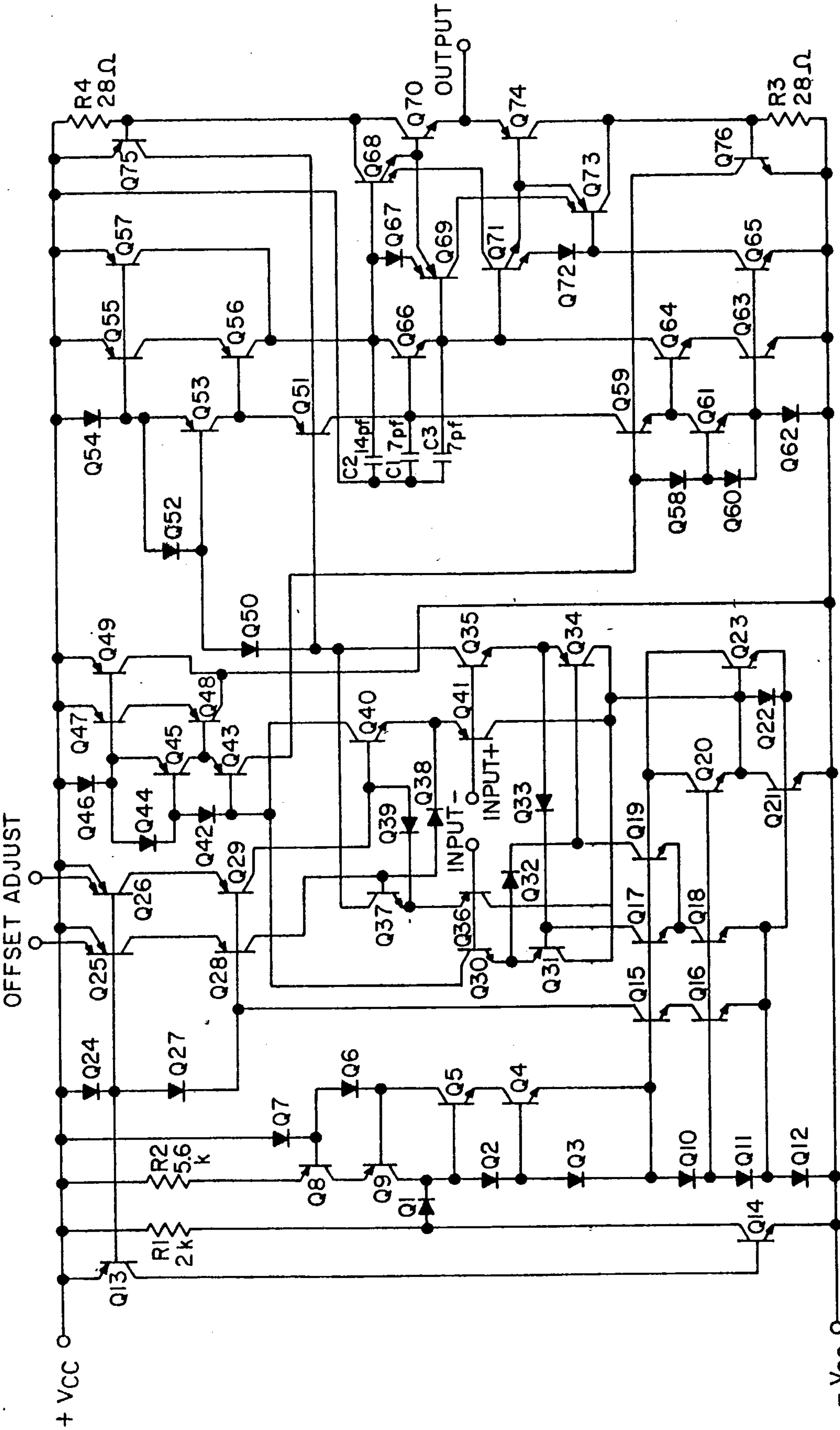
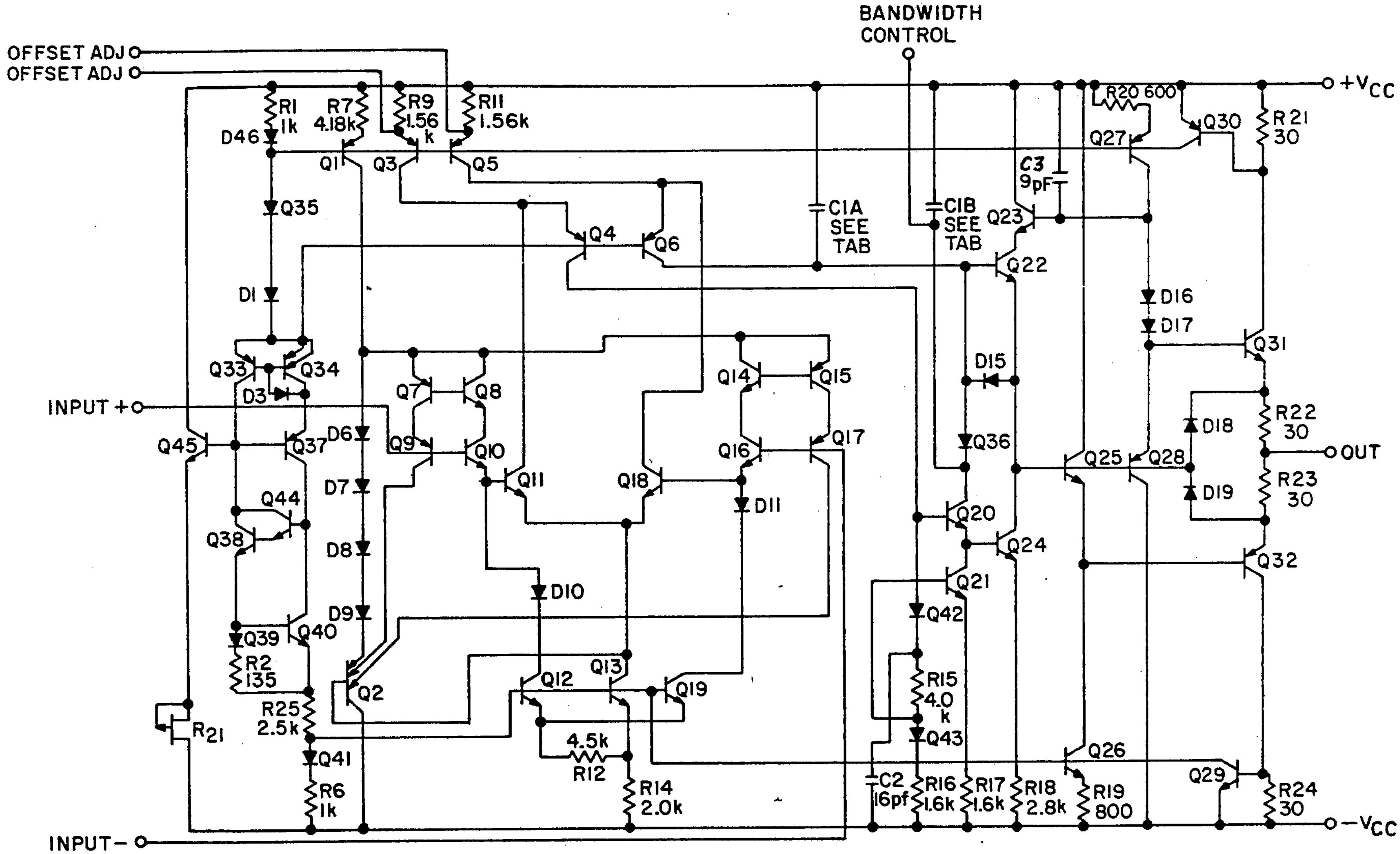


FIGURE 2. Schematic circuits.

Device types 02 and 03

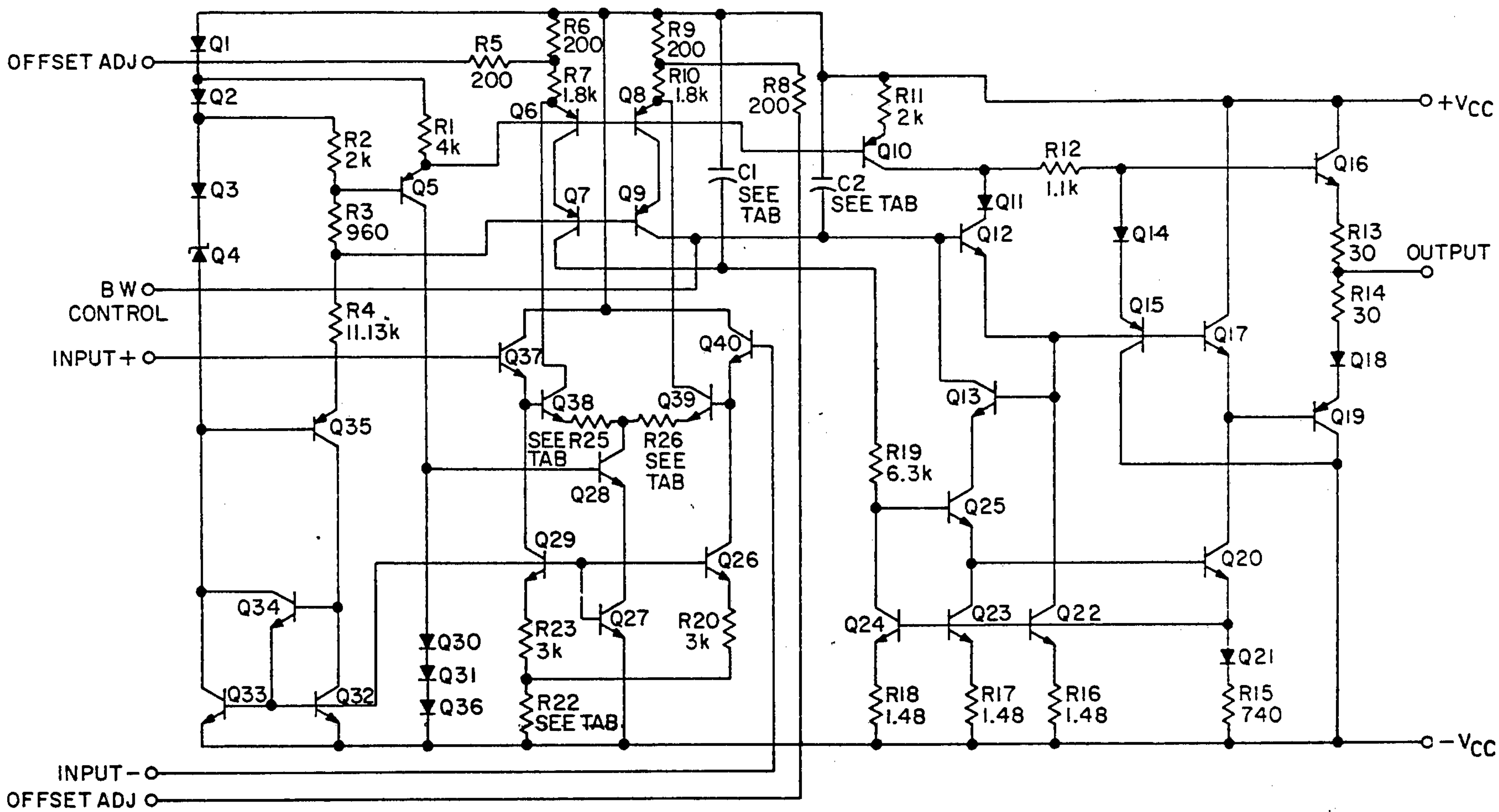


	C1A	C1B
02	16 pF	4 pF
03	---	---

NOTE: Unless otherwise specified, resistance values are in ohms.

FIGURE 2. Schematic circuits - Continued.

Device types 04 and 05

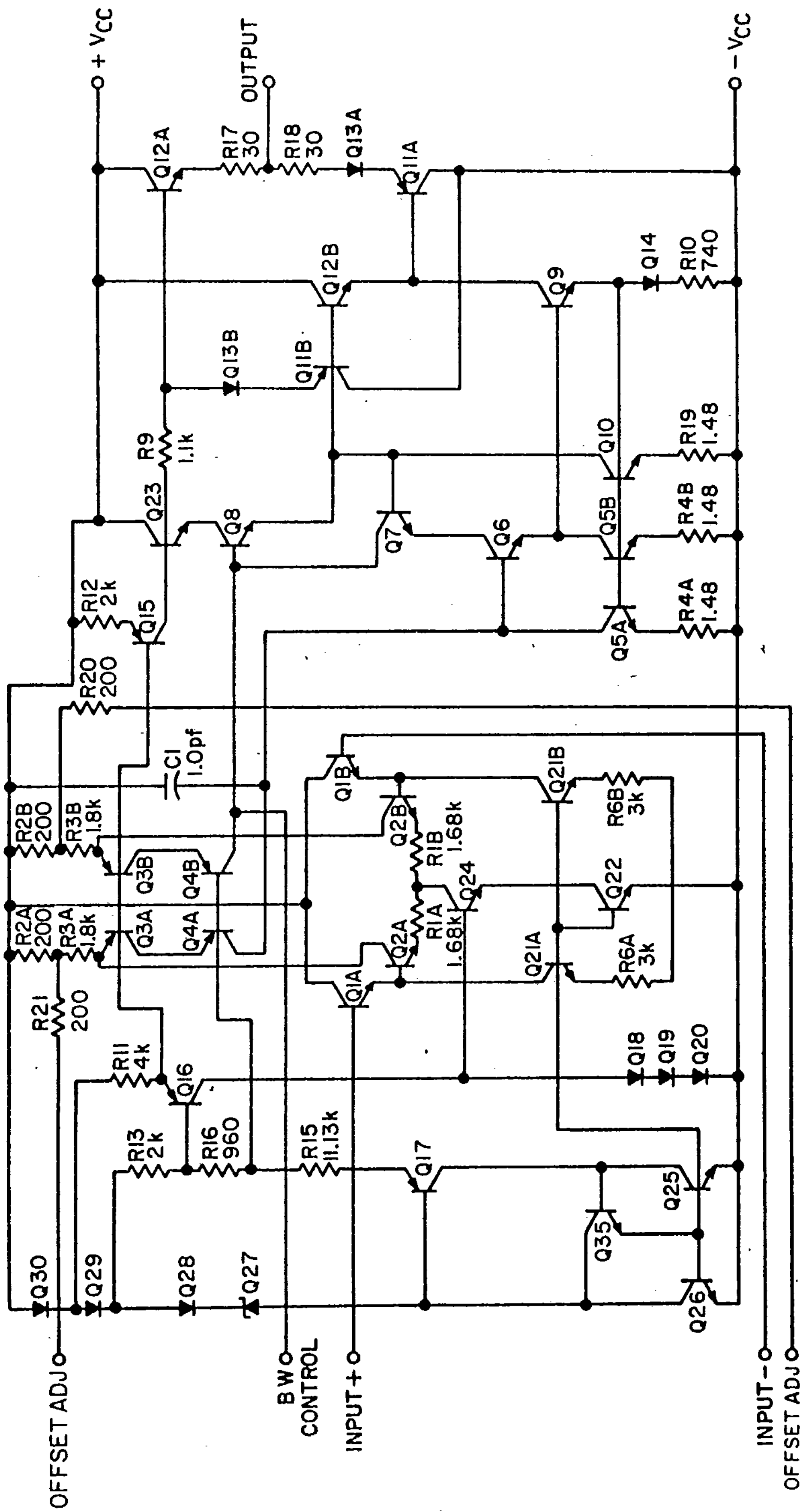


	R25,R26	C1	C2	R22
04	0.8 kΩ	10 pF	10.6 pF	1.12 kΩ
05	1.68 kΩ	10 pF	2.70 pF	240Ω

NOTE: Unless otherwise specified, resistance values are in ohms; capacitance values are in picofarads.

FIGURE 2. Schematic circuits - Continued.

Device type 06



NOTE: Unless otherwise specified, resistance values are in ohms.

FIGURE 2. Schematic circuits - Continued.

Device types 07 and 08

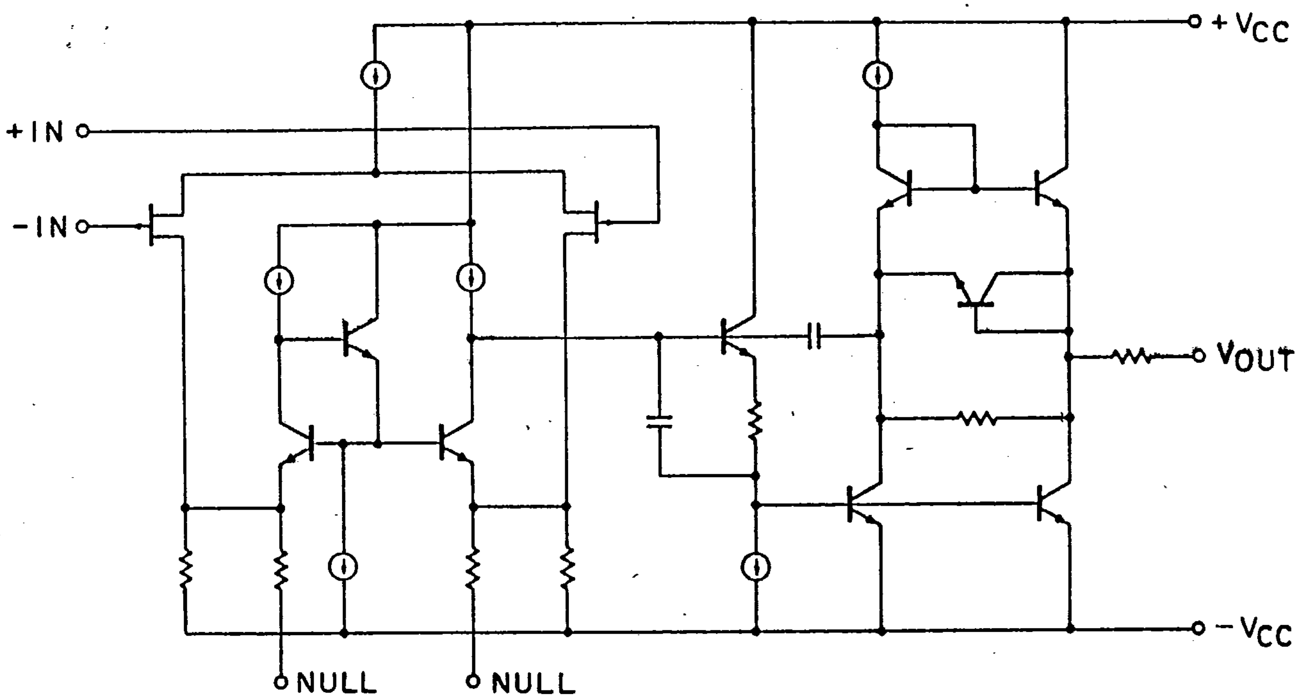


FIGURE 2. Schematic circuits - Continued.

Device types:	01	R1 = 1 MΩ
	02, 03	R1 = 100 kΩ
	04, 05, 06	R1 = 20 kΩ

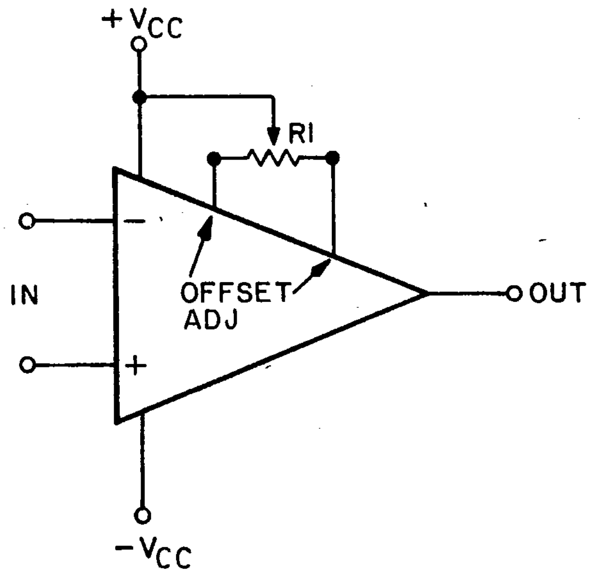
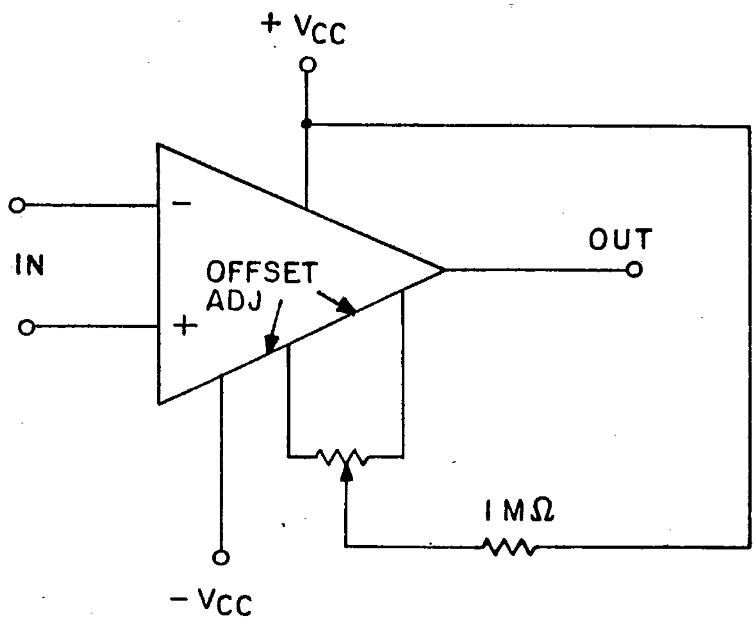


FIGURE 3. Offset null circuit (device types 01 through 06).

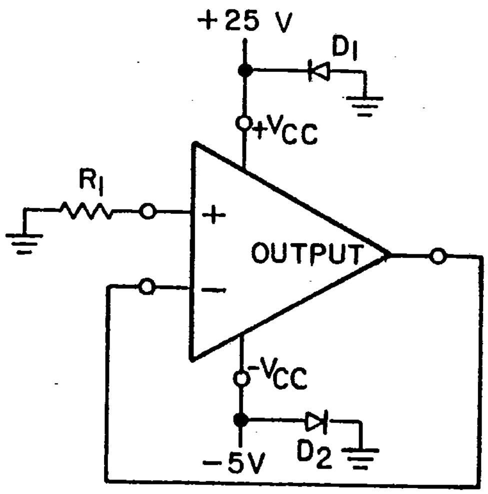
Device types 07 and 08



NOTE: Potentiometer, 10 kΩ to 100 kΩ .

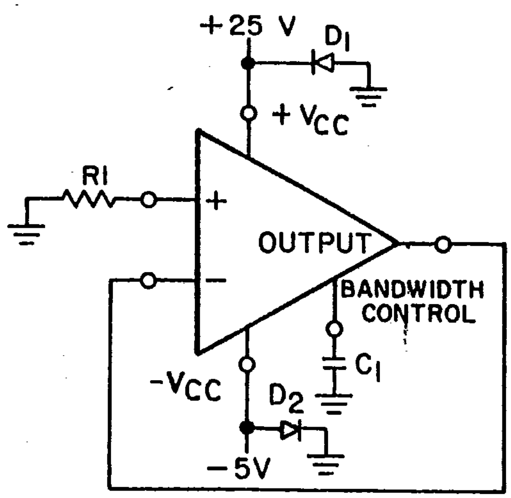
FIGURE 3. Alternate offset null circuit - Continued.

Device type 01



R_1 = 1 MΩ.
D_1, D_2 = JAN1N5616, JAN1N5614, or equivalent.

Device types 02, 03, 04, 05, and 06



R_1 = 1 MΩ.
C_1 = 0.01 μF, 100 V.
D_1, D_2 = JAN1N5616,
JAN1N5614, or
equivalent.

FIGURE 4. Test circuit for steady-state, accelerated burn-in, and operating life tests.

Device types 07 and 08

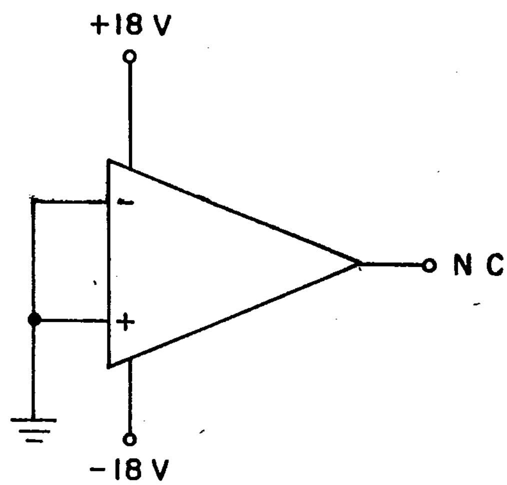
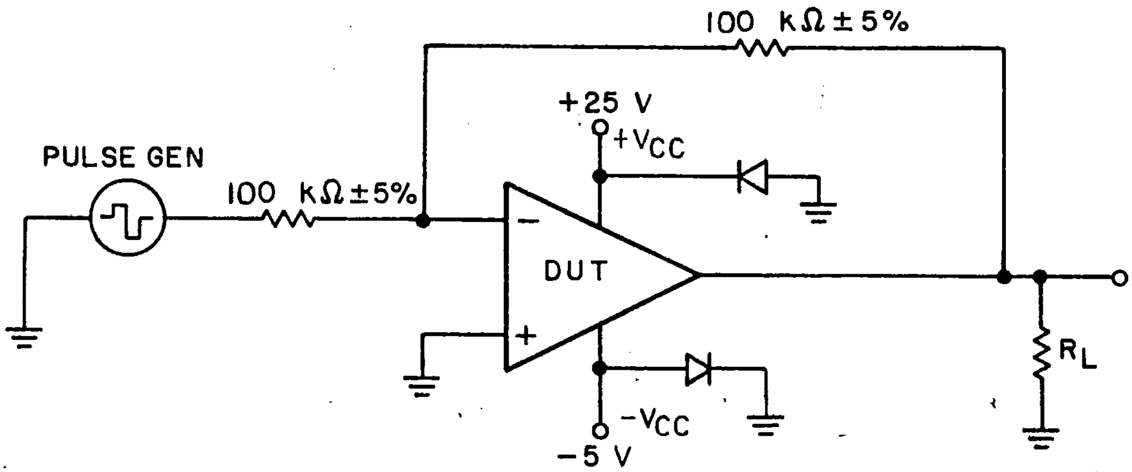


FIGURE 4. Test circuit for steady-state, accelerated burn-in, and operating life tests - Continued.

Device types 01 through 06



NOTES:
1. Input signal requirements:

   a. Square wave, 50% duty cycle.
   b. ±V = 5.0 V for all device types.
   c. f = 5 Hz.
   d. t_{TLH} and t_{THL} < 1 μs.

2. A 100 pF compensation capacitor is required for device types 03 and 06.
3. R_L = 750Ω ±5% for device types 01, 04, 05, 06; R_L = 510Ω ±5% for device types 02 and 03.

FIGURE 5. Test circuit for dynamic burn-in and operating life tests.

Device type 01

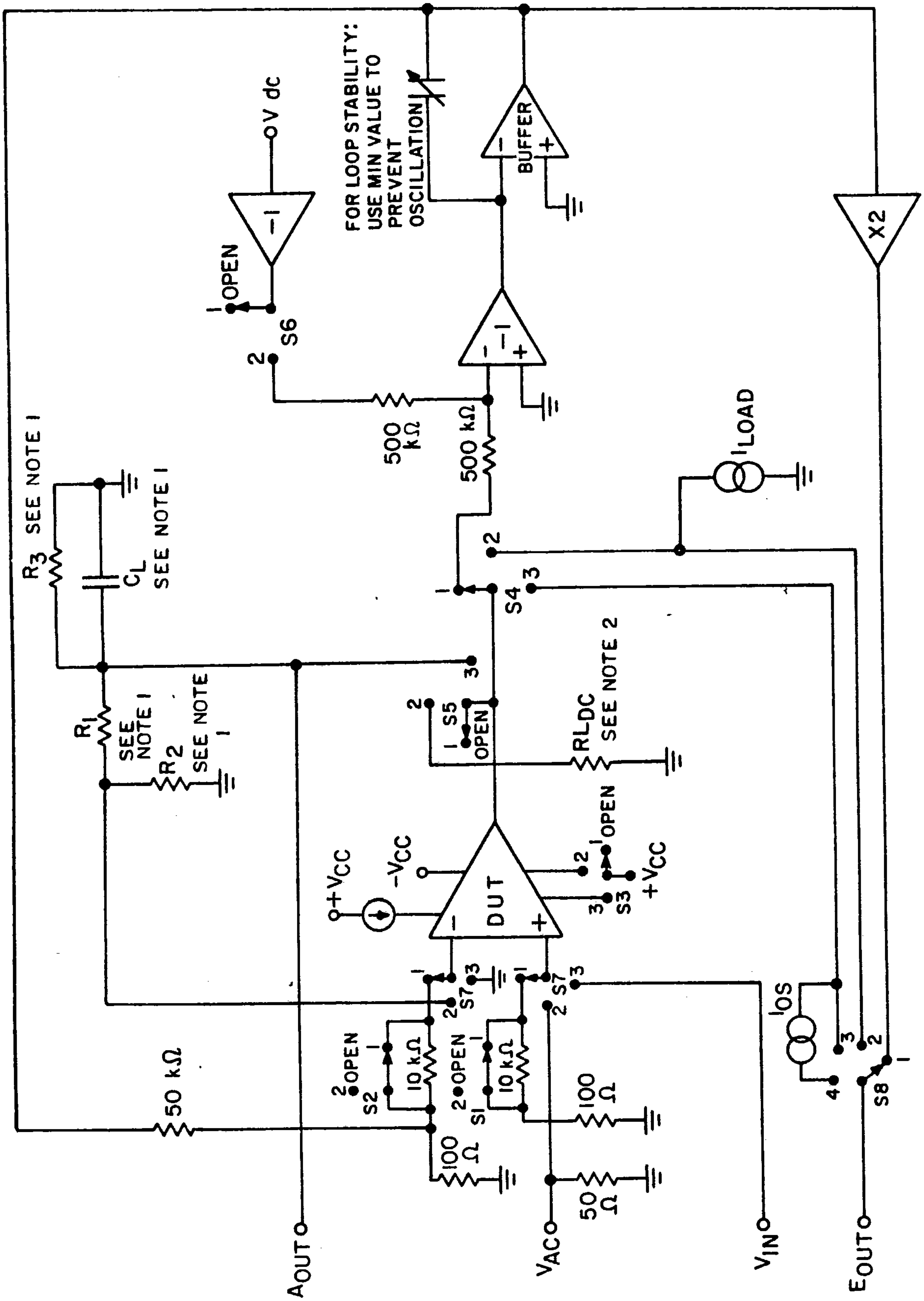


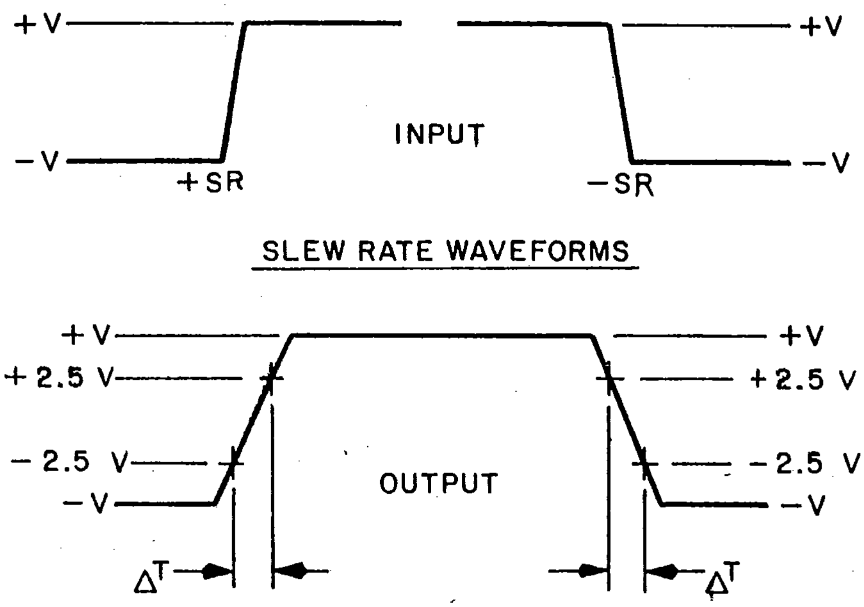
FIGURE 6. Test circuit for static and dynamic tests.

Device type 01.

Parameter	Apply (in volts)					Switch positions								Measure		Measured parameter	Unit
	$+V_{CC}$	$-V_{CC}$	V_{DC}	V_{AC}	V_{IN}	S1	S2	S3	S4	S5	S6	S7	S8	Value	Unit	Equation	
V_{IO}	15 25 5	-15 -5 -25	0 10 -10			1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	E1 E2 E3	V	V_{IO} = E1, E2, E3	mV
I_{IO}	15 25 5	-15 -5 -25	0 10 -10			2 2 2	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	E4 E5 E6	V	I_{IO} = (E1-E4) x 100, (E2-E5) x 100, (E3-E6) x 100	nA
$+I_{IB}$	15 25 5	-15 -5 -25	0 10 -10			2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	E7 E8 E9	V	$+I_{IB}$ = (E1-E7) x 100, (E2-E8) x 100, (E3-E9) x 100	nA
$-I_{IB}$	15 25 5	-15 -5 -25	0 10 -10			1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	E10 E11 E12	V	$-I_{IB}$ = (E1-E10) x 100, (E2-E11) x 100, (E3-E12) x 100	nA
I_{CC}	15	-15	0			1	1	1	1	1	2	1	1		mA	I_{CC}	mA
+PSRR	10 20	-15 -15	0 0			1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	E13 E14	V	$+PSRR = 20 \log 10 \frac{10^4}{E13-E14}$	dB
-PSRR	15 15	-10 -20	0 0			1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	E15 E16	V	$-PSRR = 20 \log 10 \frac{10^4}{E15-E16}$	dB
CMRR	5 25	-25 -5	-10 10			1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	E17 E18	V	$CMRR = 20 \log 10 \frac{2 \times 10^4}{E17-E18}$	dB
$+V_{IO(ADJ)}$ See notes 1 and 3	15	-15				1	1	2	3	3	1	2	3	E19	V	$+V_{IO(ADJ)}$ = (E19-E1)	mV
$-V_{IO(ADJ)}$ See notes 1 and 3	15	-15				1	1	3	3	3	1	2	3	E20	V	$-V_{IO(ADJ)}$ = (E1-E20)	mV
$+V_{OUT}$ See note 4	15	-15			.5	1	1	1	2	1	1	3	2	E21	V		V
$-V_{OUT}$ See note 5	15	-15			-.5	1	1	1	2	1	1	3	2	E22	V		V
$+V_{OP}$ See note 2	15	-15			.5	1	1	1	3	2	1	3	3	E23	V		V
$-V_{OP}$ See note 2	15	-15			-.5	1	1	1	3	2	1	3	3	E24	V		V
$+A_{VS}$ See note 2	15 15	-15 -15	0 10			1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	E25 E26	V V	$+A_{VS} = \frac{10}{E26-E25}$	V/mV
$-A_{VS}$ See note 2	15 15	-15 -15	0 -10			1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	E27 E28	V	$-A_{VS} = \frac{10}{E27-E28}$	V/mV
+SR	15	-15		See note 6		1	1	1	3	3	1	2	1	A1	See notes	$+SR = \frac{\Delta V}{\Delta T}$	V/µs
-SR	15	-15		See note 7		1	1	1	3	3	1	2	1	A2	See notes	$-SR = \frac{\Delta V}{\Delta T}$	V/µs

FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device type 01



NOTES:
1. R1 = 4.0 kΩ, R2 = 1.0 kΩ, R3 - 3.4 kΩ, C_L = 100 pF.
2. RL_{DC} = 2.0 kΩ.
3. $+V_{IO(ADJ)}$ if E1 < 0; $-V_{IO(ADJ)}$ if E1 > 0.
4. I_{LOAD} = -10 mA at T_A = +25°C, -5 mA at T_A = -55°C and T_A = +125°C.
5. I_{LOAD} = +10 mA at T_A = +25°C, +5 mA at T_A = -55°C and T_A = +125°C.
6. V_{AC} = -1 V to +1 V, R1 = 4.0 kΩ, R2 = 1.0 kΩ, R3 = 3.4 kΩ, C_L = 100 pF.
7. V_{AC} = +1 V to -1 V, R1 = 4.0 kΩ, R2 = 1.0 kΩ, R3 = 3.4 kΩ, C_L = 100 pF.

FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device types 02 and 03

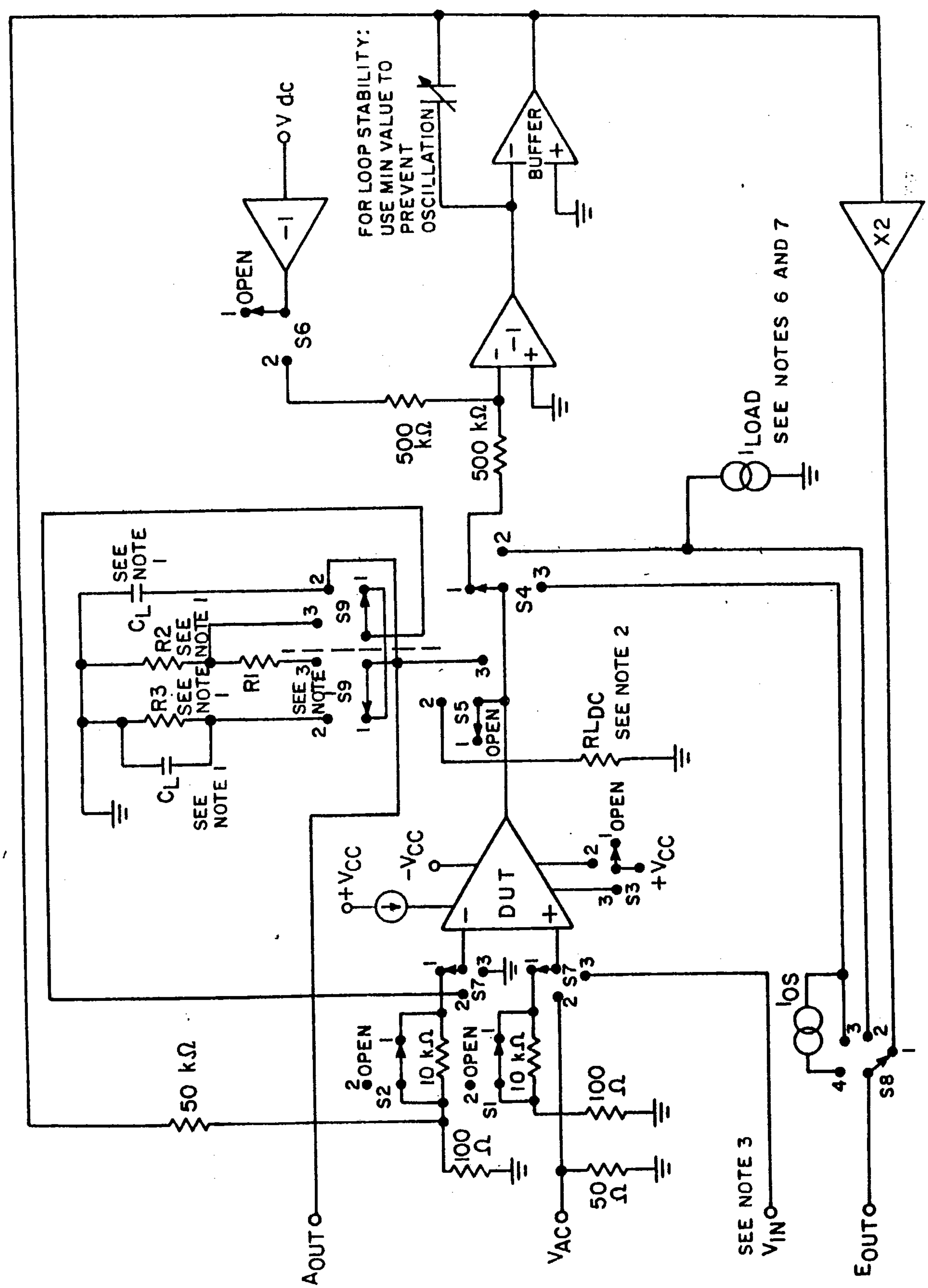


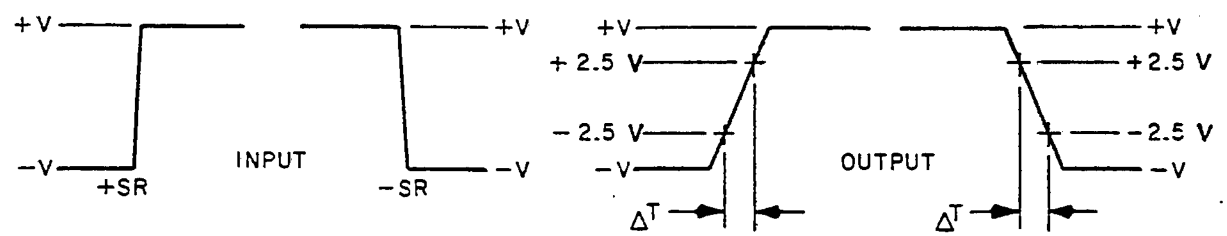
FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device types 02 and 03.

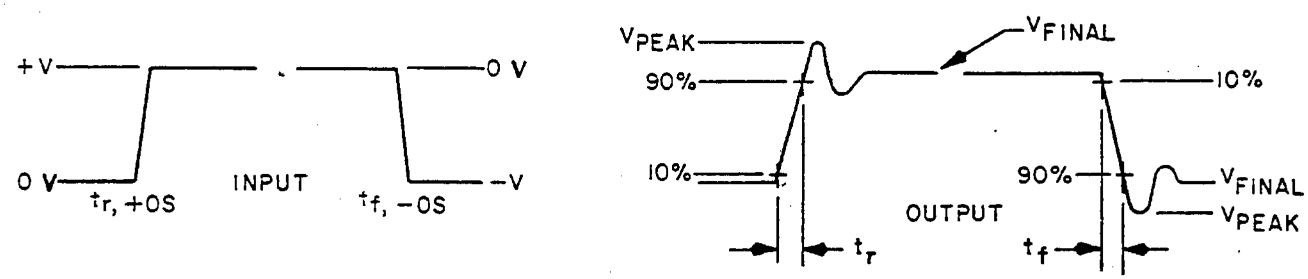
Parameter	Apply (in volts)						Switch positions										Measure		Measured parameter	Unit
	$+V_{CC}$	$-V_{CC}$	V_{DC}	V_{AC}	See note 3	V_{IN}	S1	S2	S3	S4	S5	S6	S7	S8	S9	See note 4	Value	Unit	Equation	
V_{IO}	15 25 5	-15 -5 -25	0 10 -10				1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E1 E2 E3	V	V_{IO} = E1, E2, E3	mV
I_{IO}	15 25 5	-15 -5 -25	0 10 -10				2 2 2	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E4 E5 E6	V	I_{IO} = (E1-E4) x 100, (E2-E5) x 100, (E3-E6) x 100	nA
$+I_{IB}$	15 25 5	15 -5 -25	0 10 -10				2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E7 E8 E9	V	$+I_{IB}$ = (E1-E7) x 100, (E2-E8) x 100, (E3-E9) x 100	nA
$-I_{IB}$	15 25 5	15 -5 -25	0 10 -10				1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E10 E11 E12	V	$-I_{IB}$ = (E1-E10) x 100, (E2-E11) x 100, (E3-E12) x 100	nA
I_{CC}	15	-15	0				1	1	1	1	1	2	1	1	1	1		mA	I_{CC}	mA
+PSRR	10 20	-15 -15	0 0				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E13 E14	V	+PSRR = 20 log 10 $\frac{10^4}{E13-E14}$	dB
-PSRR	15 15	-10 -20	0 0				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E15 E16	V	-PSRR = 20 log 10 $\frac{10^4}{E15-E16}$	dB
CMRR	5 25	-25 -5	-10 10				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E17 E18	V	CMRR = 20 log 10 $\frac{2 \times 10^4}{E17-E18}$	dB
$+V_{IO(ADJ)}$ See notes 1 and 5	15	-15					1	1	2	3	3	1	2	3	1	3	E19	V	$+V_{IO(ADJ)}$ = (E19-E1)	mV
$-V_{IO(ADJ)}$ See notes 1 and 5	15	-15					1	1	3	3	3	1	2	3	1	3	E20	V	$-V_{IO(ADJ)}$ = (E1-E20)	mV
$+V_{OUT}$ See note 6	15	-15				.5	1	1	1	2	1	1	3	2	1	1	E21	V		V
$-V_{OUT}$ See note 7	15	-15				-.5	1	1	1	2	1	1	3	2	1	1	E22	V		V
$+V_{OP}$ See note 2	15	-15				.5	1	1	1	3	2	1	3	3	1	1	E23	V		V
$-V_{OP}$ See note 2	15	-15				-.5	1	1	1	3	2	1	3	3	1	1	E24	V		V
$+A_{VS}$ See note 2	15 15	-15 -15	0 10				1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	1 1	1 1	E25 E26	V V	+AVS = $\frac{10}{E26-E25}$	mV
$-A_{VS}$ See note 2	15 15	-15 -15	0 -10				1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	1 1	1 1	E27 E28	V V	-AVS = $\frac{10}{E27-E28}$	mV
$TR_{(tr)}$ See note 1	15	-15		See note 8	See note 9		1	1	1	3	3	1	2	1	2	3	A1	See notes	$TR_{(tr)}$ = 10% - 90%	ns
$TR_{(tf)}$	15	-15		See note 10	See note 11		1	1	1	3	3	1	2	1	2	3	A2	See notes	$TR_{(tf)}$ = 90% - 10%	ns
+OS See note 1	15	-15		See note 8	See note 9		1	1	1	3	3	1	2	1	2	3	A3	See notes	OS = $\frac{(V_{peak}-V_{final})}{V_{final}} \times 100$	%
-OS	15	-15		See note 10	See note 11		1	1	1	3	3	1	2	1	2	3	A4	See notes		%
+SR See note 1	15	-15		See note 12	See note 13		1	1	1	3	3	1	2	1	2	3	A5	See notes	SR = $\frac{\Delta V}{\Delta T}$	V/µs
-SR	15	-15		See note 14	See note 15		1	1	1	3	3	1	2	1	2	3	A6	See notes		V/µs

FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device types 02 and 03



SLEW RATE WAVEFORMS

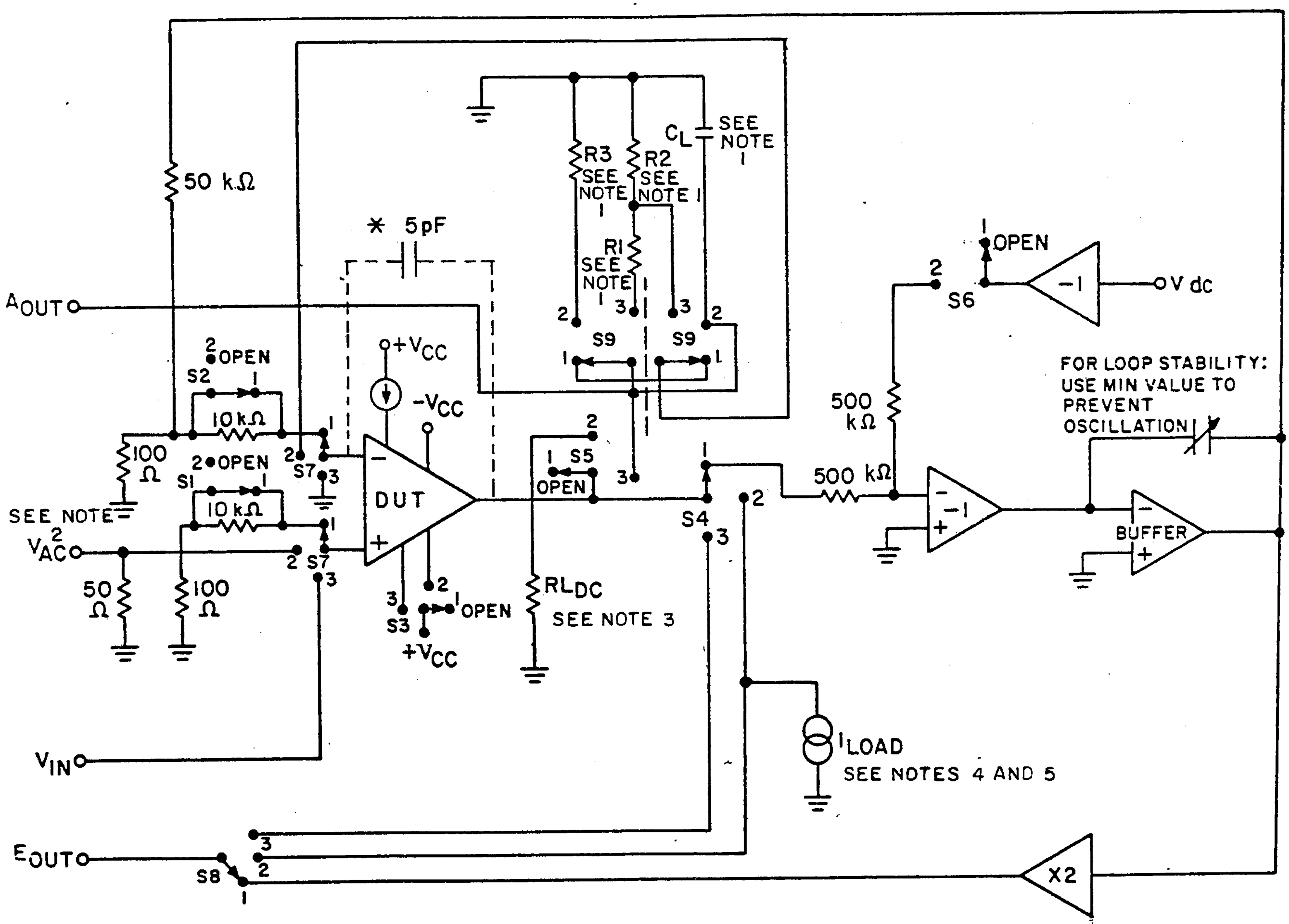


OVERSHOOT, RISE, AND FALL TIME WAVEFORMS

NOTES:
1. R1 = 1.6 kΩ, R2 = 400Ω, R3 = 2 kΩ, C_L = 50 pF, see above figure.
2. RL_{DC}= 2 kΩ.
3. V_{AC} input for device type 03 only.
4. S9 switch positions for device type 03 only.
5. $+V_{IO(ADJ)}$ if E1 < 0; $-V_{IO(ADJ)}$ if E1 > 0.
6. I_{LOAD} = -10 mA at T_A = +25°C, -5 mA at T_A = -55°C and T_A = +125°C.
7. I_{LOAD} = +10 mA at T_A = +25°C, +5 mA at T_A = -55°C and T_A = +125°C.
8. Input = 0 V to 200 mV, see above figure.
9. Input = 0 V to 40 mV, see above figure.
10. Input = 0 V to -200 mV, see above figure.
11. Input = 0 V to -40 mV, see above figure.
12. Input = -5 V to +5 V, see above figure.
13. Input = -1 V to +1 V, see above figure.
14. Input = +5 V to -5 V, see above figure.
15. Input = +1 V to -1 V, see above figure.

FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device types 04, 05, and 06



* INCLUDES STRAY CAPACITANCES

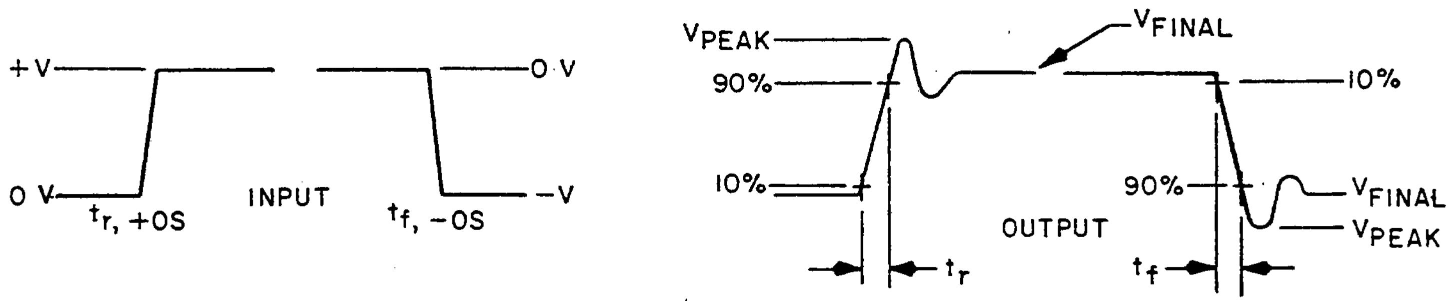
FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device types 04, 05, and 06.

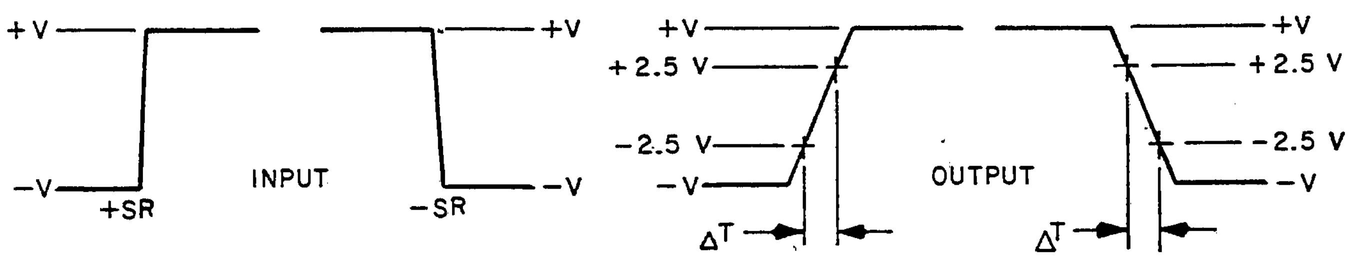
Parameter	Apply (in volts) $+V_{CC}$	$-V_{CC}$	V_{DC}	V_{AC}	See note 2	V_{IN}	Switch positions S1	S2	S3	S4	S5	S6	S7	S8	S9	See note 6	Measure Value	Unit	Measured parameter Equation	Unit
V_{IO}	15 25 5	-15 -5 -25	0 10 -10				1 1 1	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E1 E2 E3	V	V_{IO} = E1, E2, E3	mV
I_{IO}	15 25 5	-15 -5 -25	0 10 -10				2 2 2	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E4 E5 E6	V	I_{IO} = (E1-E4) x 100, (E2-E5) x 100, (E3-E6) x 100	nA
$+I_{IB}$	15 25 5	-15 -5 -25	0 10 -10				2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E7 E8 E9	V	$+I_{IB}$ = (E1-E7) x 100, (E2-E8) x 100, (E3-E9) x 100	nA
$-I_{IB}$	15 25 5	-15 -5 -25	0 10 -10				1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	2 2 2	1 1 1	1 1 1	1 1 1	1 1 1	E10 E11 E12	V	$-I_{IB}$ = (E1-E10) x 100, (E2-E11) x 100, (E3-E12) x 100	nA
I_{CC}	15	-15	0				1	1	1	1	1	2	1	1	1	1		mA	I_{CC}	mA
+PSRR	10 20	-15 -15	0 0				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E13 E14	V	$+PSRR = 20 \log 10 \frac{10^4}{E13-E14}$	dB
-PSRR	15 15	-10 -20	0 0				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E15 E16	V	$-PSRR = 20 \log 10 \frac{10^4}{E15-E16}$	dB
CMRR	5 25	-25 -5	-10 10				1 1	1 1	1 1	1 1	1 1	2 2	1 1	1 1	1 1	1 1	E17 E18	V	$CMRR = 20 \log 10 \frac{2 \times 10^4}{E17-E18}$	dB
$+V_{IO(ADJ)}$ See notes 1 and 7	15	-15					1	1	2	3	3	1	2	3	1	3	E19	V	$+V_{IO(ADJ)}$ = (E19-E1)	mV
$-V_{IO(ADJ)}$ See notes 1 and 7	15	-15					1	1	3	3	3	1	2	3	1	3	E20	V	$-V_{IO(ADJ)}$ = (E1-E20)	mV
$+V_{OUT}$ See note 4	15	-15				.5	1	1	1	2	1	1	3	2	1	1	E21	V		V
$-V_{OUT}$ See note 5	15	-15				-.5	1	1	1	2	1	1	3	2	1	1	E22	V		V
$+V_{OP}$ See note 3	15	-15				.5	1	1	1	3	2	1	3	3	1	1	E23	V		V
$-V_{OP}$ See note 3	15	-15				-.5	1	1	1	3	2	1	3	3	1	1	E24	V		V
$+A_{VS}$ See note 3	15 15	-15 -15	0 10				1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	1 1	1 1	E25 E26	V V	$+A_{VS} = \frac{10}{E26-E25}$	V/mV
$-A_{VS}$ See note 3	15 15	-15 -15	0 -10				1 1	1 1	1 1	1 1	2 2	2 2	1 1	1 1	1 1	1 1	E27 E28	V V	$-A_{VS} = \frac{10}{E27-E28}$	V/mV
$TR_{(tr)}$ See note 1	15	-15		See note 8	See note 9		1	1	1	3	3	1	2	1	2	3	A1	See notes	$TR_{(tr)}$ = 10% - 90%	ns
$TR_{(tf)}$	15	-15		See note 10	See note 11		1	1	1	3	3	1	2	1	2	3	A2		$TR_{(tf)}$ = 90% - 10%	ns
+OS See note 1	15	-15		See note 8	See note 9		1	1	1	3	3	1	2	1	2	3	A3	See notes	$OS = \frac{(V_{peak}-V_{final}) \times 100}{V_{final}}$	%
-OS	15	-15		See note 10	See note 11		1	1	1	3	3	1	2	1	2	3	A4			%
+SR See note 1	15	-15		See note 12	See note 13		1	1	1	3	3	1	2	1	2	3	A5	See notes	$SR = \frac{\Delta V}{\Delta T}$	V/µs
-SR	15	-15		See note 10	See note 11		1	1	1	3	3	1	2	1	2	3	A6			V/µs

FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device types 04, 05, and 06



OVERSHOOT, RISE & FALL TIME WAVEFORMS



SLEW RATE WAVEFORMS

NOTES:
1. R1 = 1.33 kΩ, R2 = 667Ω, R3 = 2 kΩ, C_L = 50 pF, see above figure.
2. V_{AC} input for device type 06 only.
3. RL_{DC} = 2 kΩ.
4. I_{LOAD} = -10 mA at T_A = +25°C, -5 mA at T_A = -55°C and T_A = +125°C.
5. I_{LOAD} = +10 mA at T_A = +25°C, +5 mA at T_A = -55°C and T_A = +125°C.
6. S9 switch positions for device type 06 only.
7. $+V_{IO(ADJ)}$ if E1 < 0; $-V_{IO(ADJ)}$ if E1 > 0.
8. Input = 0 V to 200 mV, see above figure.
9. Input = 0 V to +66.7 mV, see above figure.
10. Input = 0 V to -200 mV, see above figure.
11. Input = 0 V to -66.7 mV, see above figure.
12. Input = -5 V to +5 V, see above figure.
13. Input = -1.67 V to +1.67 V, see above figure.
14. Input = +5 V to -5 V, see above figure.
15. Input = +1.67 V to -1.67 V, see above figure.

FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device type 07

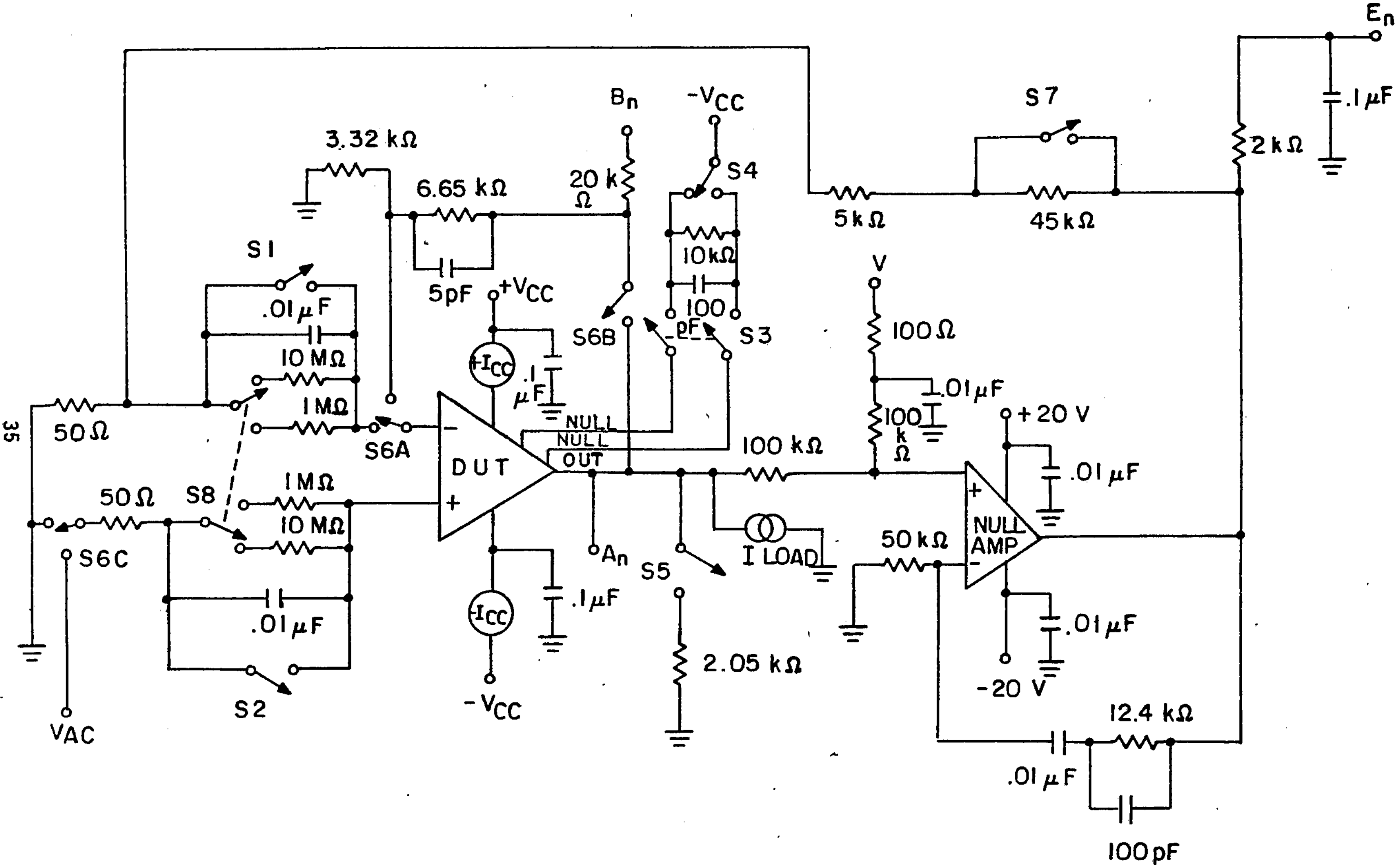


FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device type 08

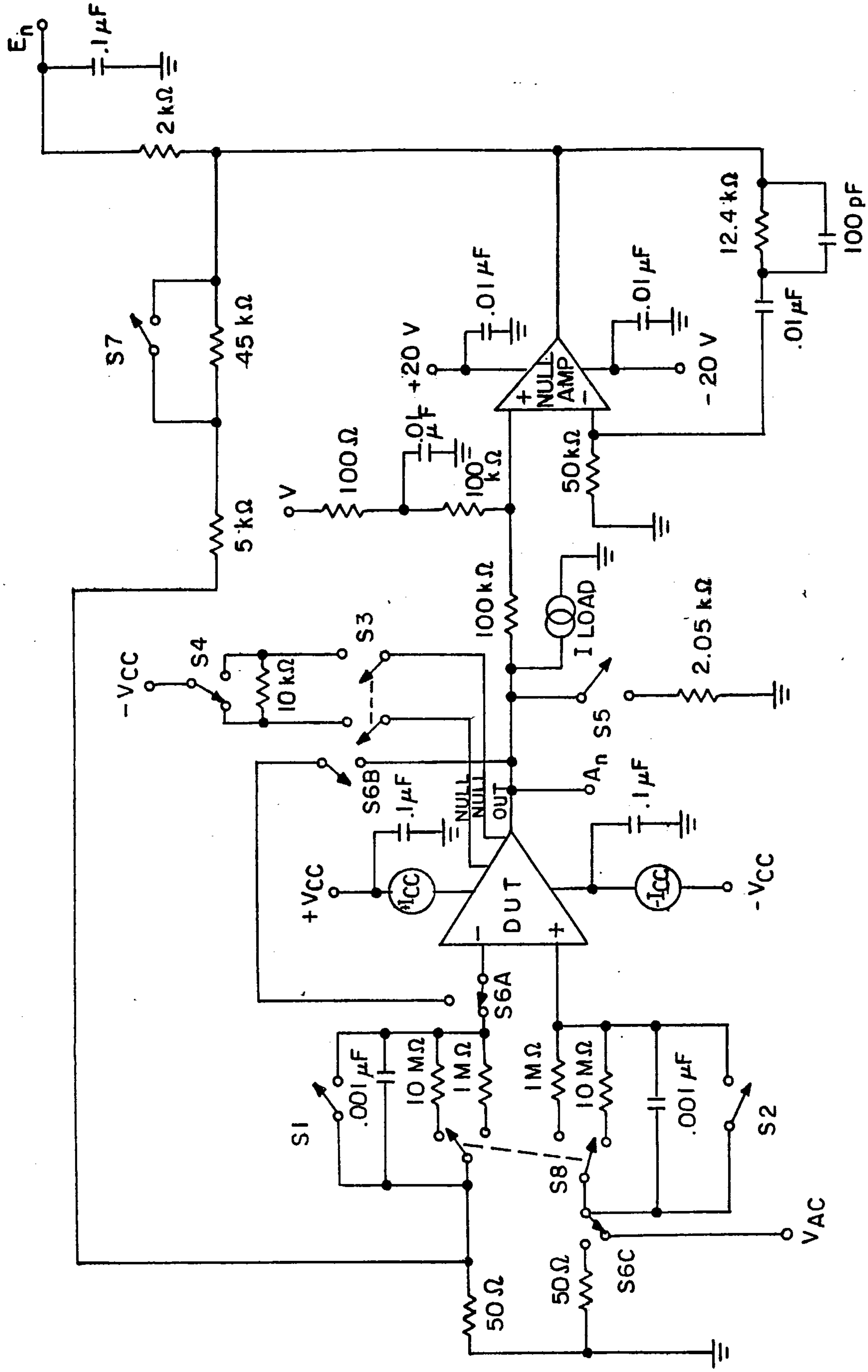


FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device types 07 and 08.

Parameter	Apply (in volts)			Switch positions (0 = Open, C = Closed)								Measure		Measured parameter	Units
	$+V_{CC}$	$-V_{CC}$	V	S1	S2	S3	S4	S5	S6	S7	S8	Value	Units	Equation	
V_{IO}	15	-15	0	C	C	0	0	0	0	0	0	E1	V	V_{IO} = E1/1000	mV
	25	-5	-10	C	C	0	0	0	0	0	0	E2	V	V_{IO} = E2/1000	mV
	5	-25	10	C	C	0	0	0	0	0	0	E3	V	V_{IO} = E3/1000	mV
I_{IO}	15	-15	0	0	0	0	0	0	0	0	C	E4	V	I_{IO} = (E1-E4)/1000 /1 MΩ	pA
See note 1	25	-5	-10	0	0	0	0	0	0	0	C	E5	V	I_{IO} = (E2-E5)/1000 /1 MΩ	pA
	5	-25	10	0	0	0	0	0	0	0	C	E6	V	I_{IO} = (E3-E6)/1000 /1 MΩ	pA
$+I_{IB}$	15	-15	0	C	0	0	0	0	0	0	C	E7	V	$+I_{IB}$ = (E1-E7)/1000 /1 MΩ	pA
See note 1	25	-5	-10	C	0	0	0	0	0	0	C	E8	V	$+I_{IB}$ = (E2-E8)/1000 /1 MΩ	pA
	5	-25	10	C	0	0	0	0	0	0	C	E9	V	$+I_{IB}$ = (E3-E9)/1000 /1 MΩ	pA
$-I_{IB}$	15	-15	0	0	C	0	0	0	0	0	C	E10	V	$-I_{IB}$ = (E10-E1)/1000 /1 MΩ	pA
See note 1	25	-5	-10	0	C	0	0	0	0	0	C	E11	V	$-I_{IB}$ = (E11-E2)/1000 /1 MΩ	pA
	5	-25	10	0	C	0	0	0	0	0	C	E12	V	$-I_{IB}$ = (E12-E3)/1000 /1 MΩ	pA
+PSRR	10	-15	0	C	C	0	0	0	0	0	0	E13	V	+PSRR = 20 log 10(1000/ E14-E13)	dB
	20	-15	0	C	C	0	0	0	0	0	0	E14	V		
-PSRR	15	-10	0	C	C	0	0	0	0	0	0	E15	V	-PSRR = 20 log 10(1000/ E16-E15)	dB
	15	-20	0	C	C	0	0	0	0	0	0	E16	V		
CMRR														CMRR = 20 log (20/ $\frac{E3-E7}{1000}$)	dB
$+V_{IO(ADJ)}$	15	-15	0	C	C	C	C	0	0	0	0	E17	V	$+V_{IO(ADJ)}$ = E17/1000	mV
$-V_{IO(ADJ)}$	15	-15	0	C	C	C	0	0	0	0	0	E18	V	$-V_{IO(ADJ)}$ = E18/1000	mV

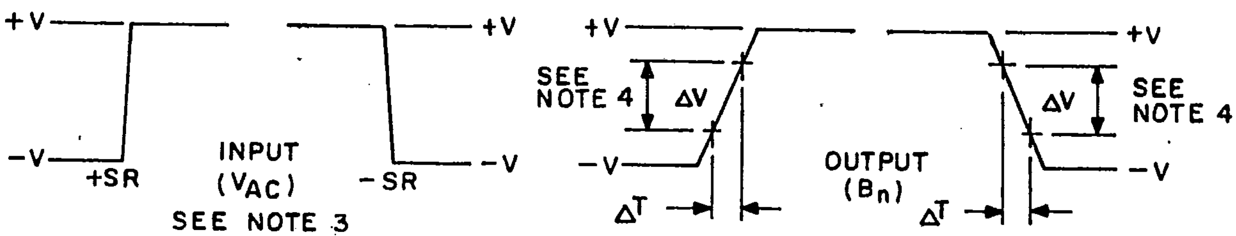
FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device types 07 and 08 - Continued.

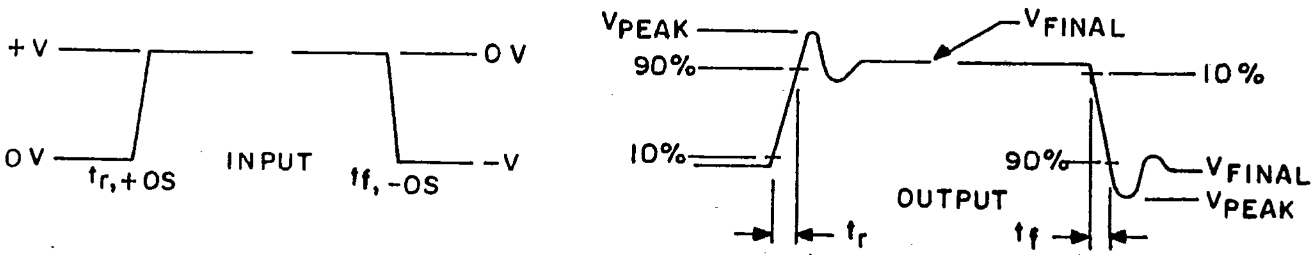
Parameter	Apply (in volts)			Switch positions 0 = Open				C = Closed				Measure		Measured parameter	Units
	$+V_{CC}$	$-V_{CC}$	V	S1	S2	S3	S4	S5	S6	S7	S8	Value	Units	Equation	
$+I_{CC}$	15	-15	0	C	C	0	0	0	0	0	0	$+I_{CC}$	mA	$+I_{CC} = +I_{CC}$	mA
$-I_{CC}$	15	-15	0	C	C	0	0	0	0	0	0	$-I_{CC}$	mA	$-I_{CC} = -I_{CC}$	mA
$+V_{OP}$	15	-15	-20	C	C	0	0	C	0	0	0	A1	V	$+V_{OP} = A1$	V
$-V_{OP}$	15	-15	+20	C	C	0	0	C	0	0	0	A2	V	$-V_{OP} = A2$	V
$+A_{VS}$	15	-15	0	C	C	0	0	C	0	0	0	E19	V	$+A_{VS} = 10/ \frac{E20-E19}{1000}$	V/mV
	15	-15	-10	C	C	0	0	C	0	0	0	E20	V		
$-A_{VS}$	15	-15	+10	C	C	0	0	C	0	0	0	E21	V	$-A_{VS} = 10/ \frac{E21-E19}{1000}$	V/mV
$+V_{OUT}$ See note 2	15	-15	0	C	C	0	0	0	0	0	0	A3	V	$+V_{OUT} = A3$	V
$-V_{OUT}$ See note 2	15	-15	0	C	C	0	0	0	0	0	0	A4	V	$-V_{OUT} = A4$	V
+SR See note 3	15	-15	0	C	C	0	0	0	C	0	0	B1	See notes	$+SR = \Delta V/\Delta T$	V/µs
-SR See note 4	15	-15	0	C	C	0	0	0	C	0	0	B2	See notes	$-SR = \Delta V/\Delta T$	V/µs
$TR_{(tr)}$	15	-15	0	C	C	0	0	0	C	0	0	A5	See notes	$TR_{(tr)} = t_{10\%} - t_{90\%}$	ns
$TR_{(tf)}$	15	-15	0	C	C	0	0	0	C	0	0	A6	See notes	$TR_{(tf)} = t_{90\%} - t_{10\%}$	ns
$TR_{(+OS)}$	15	-15	0	C	C	0	0	0	C	0	0	A7	See notes	$TR_{(+OS)} = \frac{(V_{PEAK} - V_{FINAL})}{V_{FINAL}} \times 100$	%
$TR_{(-OS)}$	15	-15	0	C	C	0	0	0	C	0	0	A8	See notes	$TR_{(-OS)} = \frac{(V_{PEAK} - V_{FINAL})}{V_{FINAL}} \times 100$	%

FIGURE 6. Test circuit for static and dynamic tests - Continued.

Device types 07 and 08



SLEW RATE WAVEFORMS



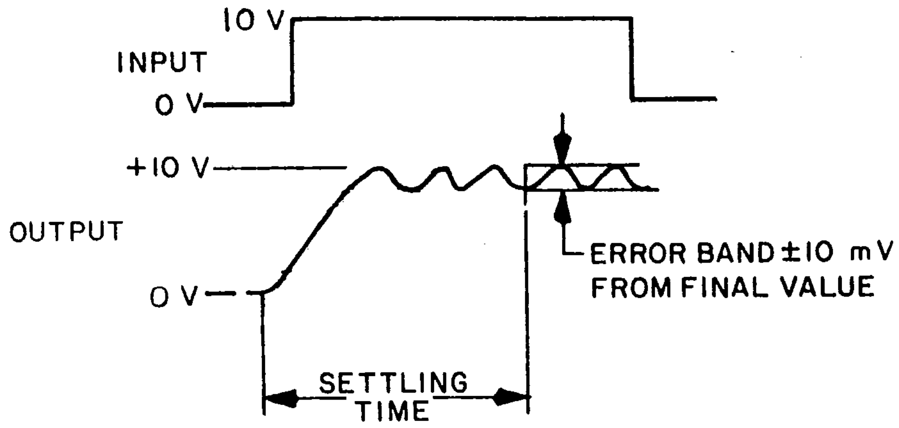
OVERSHOOT, RISE AND FALL TIME WAVEFORMS

NOTES:

1. At T_A = +125°C, S7 shall be closed and the factor of 1000 shall be replaced with a factor of 100 in all equations for I_{IO}, $+I_{IB}$, and $-I_{IB}$. Also, the units shall be nA.
2. I_{LOAD} = - 10 mA at T_A = +25°C, -5 mA at T_A = -55°C and T_A = +125°C.
3. V_{AC} = -1.0 V to +1.0 V for device type 07, V_{AC} = -10.0 V to +10.0 V for device type 08.
4. ΔV = -3.3 V to +3.3 V for device type 07, ΔV = -5.0 V to +5.0 V for device type 08.
5. Any oscillation of 300 mV p-p or greater shall be cause for device failure.
6. All resistors are ±1% tolerance and all capacitors are ±10% tolerance, unless otherwise indicated.
7. I_{LOAD} = +10 mA at T_A = +25°C, +5 mA at T_A = -55°C and T_A = +125°C.

FIGURE 6. Test circuit for static dynamic tests - Continued.

Device type 02



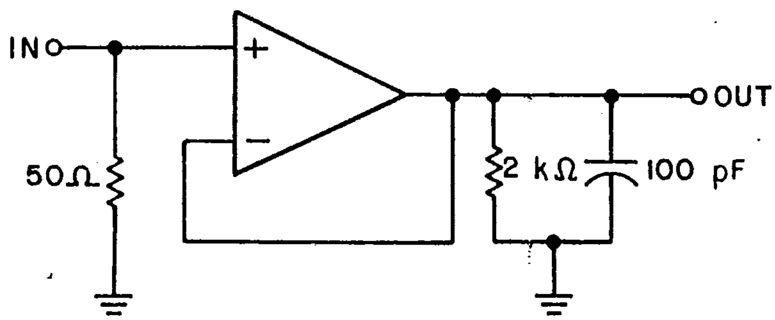
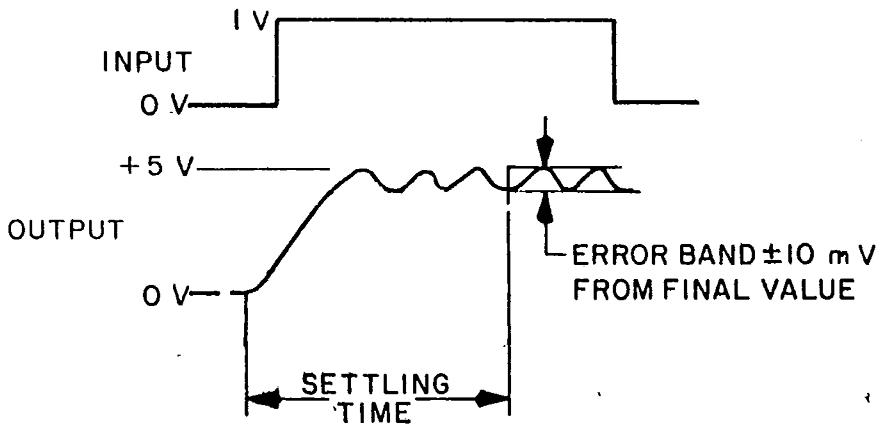


FIGURE 7. Settling time circuits.

Device type 03



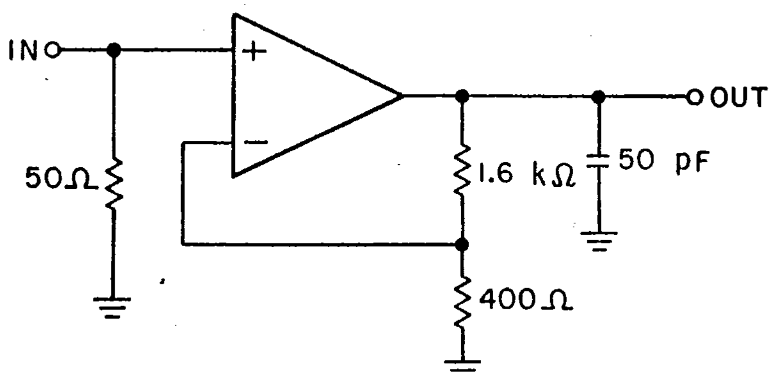
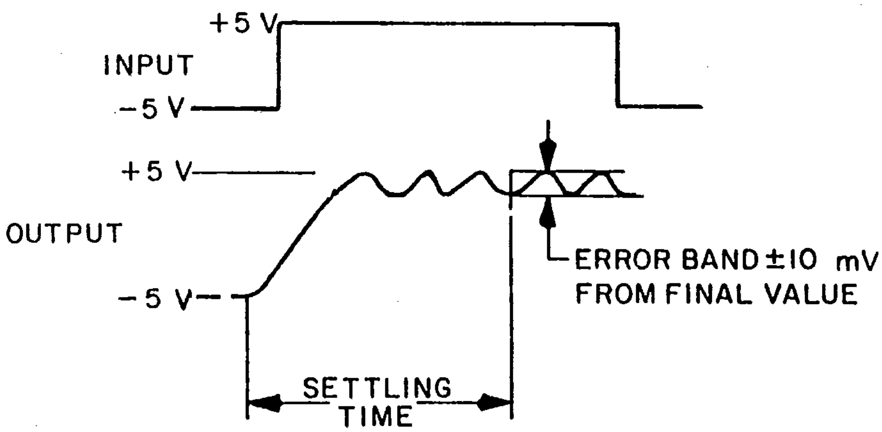


FIGURE 7. Settling time circuits - Continued.

Device types 04 and 05



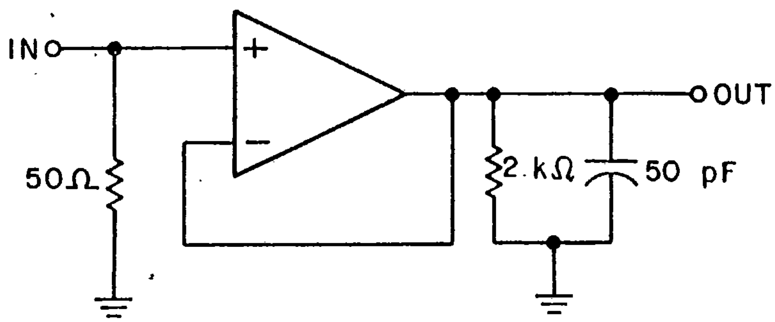
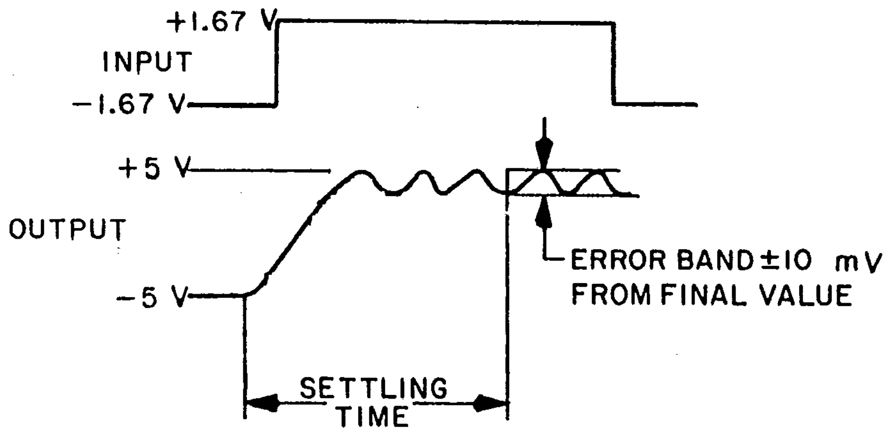


FIGURE 7. Settling time circuits - Continued.

MIL-M-38510/122A

Device types 06 and 07



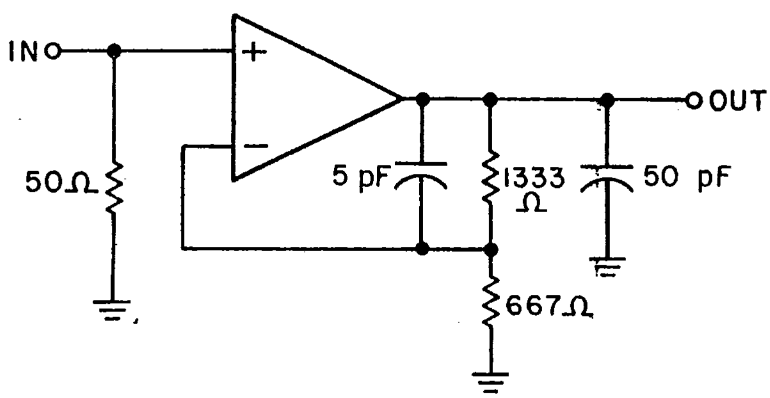
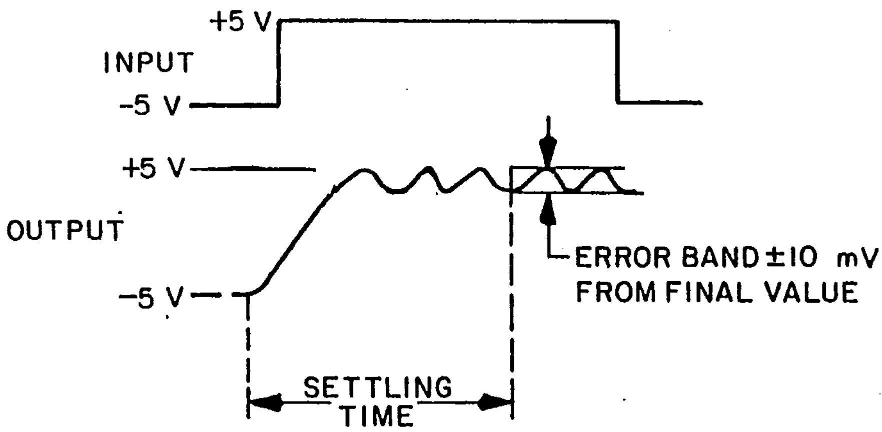
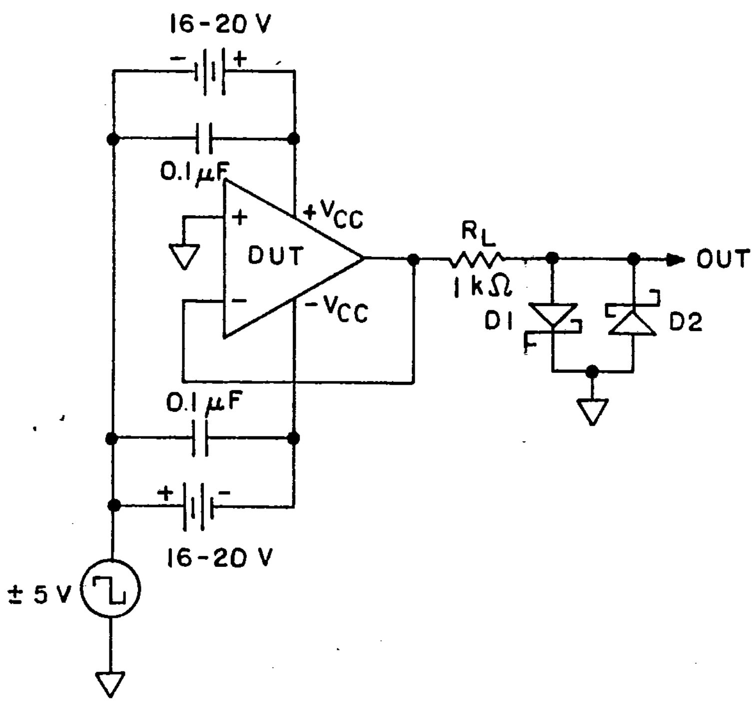


FIGURE 7. Settling time circuits - Continued.

Device type 08





SCHOTTKY DIODES D1-D2 ARE HEWLETT-PACKARD HP5082-2835 OR EQUIVALENT.

FIGURE 7. Settling time circuits - Continued.

TABLE III. Group A inspection.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Conditions $\pm V_{CC}$ = ±15 V, see figure 6, unless otherwise specified	Device type 01 limits Min	Device type 01 limits Max	Device type 02 limits Min	Device type 02 limits Max	Device type 03 limits Min	Device type 03 limits Max	Device type 04 limits Min	Device type 04 limits Max	Device types 05 and 06 limits Min	Device types 05 and 06 limits Max	Device types 07 and 08 limits Min	Device types 07 and 08 limits Max	Unit
1 T_A = +25°C	V_{IO}	4001	1	V_{CM} = 0 V	-3.0	3.0	-4.0	4.0	-4.0	4.0	-5.0	5.0	-8.0	8.0	-1.0	+1.0	mV
	V_{IO}		2	V_{CM} = -10 V 1/	-3.0	3.0	-4.0	4.0	-4.0	4.0	-5.0	5.0	-8.0	8.0	-1.0	+1.0	mV
	V_{IO}		3	V_{CM} = 10 V 1/	-3.0	3.0	-4.0	4.0	-4.0	4.0	-5.0	5.0	-8.0	8.0	-1.0	+1.0	mV
	I_{IO}		4	V_{CM} = 0 V	-10.0	10.0	-10.0	10.0	-15.0	15.0	-25.0	25.0	-25.0	25.0	-.04	+.04	nA
	I_{IO}		5	V_{CM} = -10 V 1/	-10.0	10.0	-10.0	10.0	-15.0	15.0	-25.0	25.0	-25.0	25.0	-.04	+.04	nA
	I_{IO}		6	V_{CM} = 10 V 1/	-10.0	10.0	-10.0	10.0	-15.0	15.0	-25.0	25.0	-25.0	25.0	-.04	+.04	nA
	$+I_{IB}$		7	V_{CM} = 0 V	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-.2	+.2	nA
	$+I_{IB}$		8	V_{CM} = -10 V 1/	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-.2	+.2	nA
	$+I_{IB}$		9	V_{CM} = 10 V 1/	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-.2	+.2	nA
	$-I_{IB}$		10	V_{CM} = 0 V	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-.2	+.2	nA
	$-I_{IB}$		11	V_{CM} = -10 V 1/	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-.2	+.2	nA
	$-I_{IB}$		12	V_{CM} = 10 V 1/	-20.0	20.0	-10.0	10.0	-15.0	15.0	1.0	200.0	1.0	200.0	-.2	+.2	nA
	+PSRR	4003	13	$+V_{CC}$ = 10.0 V, 20.0 V	86		80		80		80		80		84		dB
	-PSRR		14	$-V_{CC}$ = -10.0 V, -20.0 V	86		80		80		80		80		84		dB
	CMRR		15	$+V_{CC}$ = 5.0 V, 25.0 V; $-V_{CC}$ = -25 V, -5 V; V_{CM} = 10 V, -10 V	86		80		80		80		80		84 (07 only) 80 (08 only)		dB
	$+V_{IO(ADJ)}$		16	2/ 3/	4.0		5.0		5.0		6.0		9.0		2.5		mV
	$-V_{IO(ADJ)}$		17	2/ 3/		-4.0		-5.0		-5.0		-6.0		-9.0		-2.5	mV
	I_{CC}	4005	18			0.15		3.7		3.7		6.0		6.0		7.5 (07 only) 6.0 (08 only)	mA
2 T_A = +125°C	V_{IO}	4001	19	V_{CM} = 0 V	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	+2.0	mV
	V_{IO}		20	V_{CM} = -10 V 1/	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	+2.0	mV
	V_{IO}		21	V_{CM} = 10 V 1/	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	+2.0	mV
	I_{IO}		22	V_{CM} = 0 V	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	I_{IO}		23	V_{CM} = -10 V 1/	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	I_{IO}		24	V_{CM} = 10 V 1/	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	$+I_{IB}$		25	V_{CM} = 0 V	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20	+20	nA
	$+I_{IB}$		26	V_{CM} = -10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20	+20	nA
	$+I_{IB}$		27	V_{CM} = 10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20	+20	nA
	$-I_{IB}$		28	V_{CM} = 0 V	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20	+20	nA
	$-I_{IB}$		29	V_{CM} = -10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20	+20	nA
	$-I_{IB}$		30	V_{CM} = 10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20	+20	nA
	+PSRR	4003	31	$+V_{CC}$ = 10 V, 20 V	86		80		80		80		80		84		dB

See footnotes at end of table.

TABLE III. Group A inspection - Continued.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Conditions ±V_{CC} = ±15 V, see figure 6, unless otherwise specified	Device type 01 limits Min	Device type 01 limits Max	Device type 02 limits Min	Device type 02 limits Max	Device type 03 limits Min	Device type 03 limits Max	Device type 04 limits Min	Device type 04 limits Max	Device types 05 and 06 limits Min	Device types 05 and 06 limits Max	Device types 07 and 08 limits Min	Device types 07 and 08 limits Max	Unit
2 T_A = +125°C	-PSRR	4003	32	$-V_{CC}$ = -10 V, -20 V	86		80		80		80		80		84		dB
	CMRR		33	$+V_{CC}$ = 5 V, 25 V; $-V_{CC}$ = -25 V, -5 V; V_{CM} = 10 V, -10 V	86		80		80		80		80		84 (07 only) 80 (08 only)		dB
	$+V_{IO(ADJ)}$		34	2/ 3/	6.0		7.0		7.0		9.0		11.0		3.0		mV
	$-V_{IO(ADJ)}$		35	2/ 3/		-6.0		-7.0		-7.0		-9.0		-11.0		-3.0	mV
	I_{CC}	4005	36			0.20		4.0		4.0		6.5		6.5		7.5 (07 only) 6.0 (08 only)	mA
3 T_A = -55°C	V_{IO}	4001	37	V_{CM} = 0 V	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	+2.0	mV
	V_{IO}		38	V_{CM} = -10 V 1/	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	+2.0	mV
	V_{IO}		39	V_{CM} = 10 V 1/	-5.0	5.0	-6.0	6.0	-6.0	6.0	-8.0	8.0	-10.0	10.0	-2.0	+2.0	mV
	I_{IO}		40	V_{CM} = 0 V	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	I_{IO}		41	V_{CM} = -10 V 1/	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	I_{IO}		42	V_{CM} = 10 V 1/	-30.0	30.0	-30.0	30.0	-30.0	30.0	-50.0	50.0	-50.0	50.0	-1.0	+1.0	nA
	$+I_{IB}$ 4/		43	V_{CM} = 0 V	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	+20.0	nA
	$+I_{IB}$ 4/		44	V_{CM} = -10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	+20.0	nA
	$+I_{IB}$ 4/		45	V_{CM} = 10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	+20.0	nA
	$-I_{IB}$ 4/		46	V_{CM} = 0 V	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	+20.0	nA
	$-I_{IB}$ 4/		47	V_{CM} = -10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	+20.0	nA
	$-I_{IB}$ 4/		48	V_{CM} = 10 V 1/	-50.0	50.0	-30.0	30.0	-30.0	30.0	1.0	400.0	1.0	400.0	-20.0	+20.0	nA
	+PSRR	4003	49	$+V_{CC}$ = 10 V, 20 V	86		80		80		80		80		84		dB
	-PSRR		50	$-V_{CC}$ = -10 V, -20 V	86		80		80		80		80		84		dB
	CMRR		51	$+V_{CC}$ = 5 V, 25 V; $-V_{CC}$ = -25 V, -5 V; V_{CM} = 10 V, -10 V	86		80		80		80		80		84 (07 only) 80 (08 only)		dB
	$+V_{IO(ADJ)}$		52	2/ 3/	6.0		7.0		7.0		9.0		11.0		3.0		mV
	$-V_{IO(ADJ)}$		53	2/ 3/		-6.0		-7.0		-7.0		-9.0		-11.0		-3.0	mV
	I_{CC}	4005	54			0.20		4.0		4.0		6.5		6.5		7.5 (07 only) 6.0 (08 only)	mA
4 T_A = +25°C	$+V_{OP}$	4004	55	R_L = 2 kΩ	12.0		10.0		10.0		10.0		10.0		11.5		V
	$-V_{OP}$		56	R_L = 2 kΩ		-12.0		-10.0		-10.0		-10.0		-10.0		-11.5	V
	$+A_{VS}$		57	R_L = 2 kΩ, V_{OUT} = 0 V, 10 V	200.0		100.0		100.0		20.0		10.0		100.0		V/mV
	$-A_{VS}$		58	R_L = 2 kΩ, V_{OUT} = 0 V, -10 V	200.0		100.0		100.0		20.0		10.0		100.0		V/mV
	$+V_{OUT}$		59	V_{OUT} at -10 mA	10.0		10.0		10.0		10.0		10.0		10.0		V
	$-V_{OUT}$		60	V_{OUT} at 10 mA		-10.0		-10.0		-10.0		-10.0		-10.0		-10.0	V

See footnotes at end of table.

TABLE III. Group A inspection - Continued.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Conditions $\pm V_{CC} = \pm 15$ V, see figure 6, unless otherwise specified	Device type 01 limits Min	Device type 01 limits Max	Device type 02 limits Min	Device type 02 limits Max	Device type 03 limits Min	Device type 03 limits Max	Device type 04 limits Min	Device type 04 limits Max	Device types 05 and 06 limits Min	Device types 05 and 06 limits Max	Device types 07 and 08 limits Min	Device types 07 and 08 limits Max	Unit
5 $T_A = +125°C$	$+V_{OP}$	4004	61	$R_L = 2$ kΩ	11.0		10.0		10.0		10.0		10.0		11.0		V
	$-V_{OP}$		62	$R_L = 2$ kΩ		-11.0		-10.0		-10.0		-10.0		-10.0		-11.0	V
	$+A_{VS}$		63	$R_L = 2$ kΩ, $V_{OUT} = 0$ V, 10 V	100.0		70.0		70.0		15.0		7.5		70.0		V/mV
	$-A_{VS}$		64	$R_L = 2$ kΩ, $V_{OUT} = 0$ V, -10 V	100.0		70.0		70.0		15.0		7.5		70.0		V/mV
	$+V_{OUT}$		65	V_{OUT} at -10 mA, -5 mA 5/	10.0		10.0		10.0		10.0		10.0		10.0		V
	$-V_{OUT}$		66	V_{OUT} at 10 mA, 5 mA 5/		-10.0		-10.0		-10.0		-10.0		-10.0		-10.0	V
6 $T_A = -55°C$	$+V_{OP}$	4004	67	$R_L = 2$ kΩ	11.0		10.0		10.0		10.0		10.0		11.0		V
	$-V_{OP}$		68	$R_L = 2$ kΩ		-11.0		-10.0		-10.0		-10.0		-10.0		-11.0	V
	$+A_{VS}$		69	$R_L = 2$ kΩ, $V_{OUT} = 0$ V, 10 V	100.0		70.0		70.0		15.0		7.5		70.0		V/mV
	$-A_{VS}$		70	$R_L = 2$ kΩ, $V_{OUT} = 0$ V, -10 V	100.0		70.0		70.0		15.0		7.5		70.0		V/mV
	$+V_{OUT}$		71	V_{OUT} at -10 mA, -5 mA 5/	10.0		10.0		10.0		10.0		10.0		10.0		V
	$-V_{OUT}$		72	V_{OUT} at 10 mA, 5 mA 5/		-10.0		-10.0		-10.0		-10.0		-10.0		-10.0	V
7 $T_A = +25°C$	TR(tr)	4002	73	6/				60.0		45.0		50.0		50.0		50.0	ns
	TR(tf)		74	6/				60.0		45.0		50.0		50.0		50.0	ns
	TR(+OS)		75	6/				40.0		70.0		40.0		40.0		40.0	%
	TR(-OS)		76	6/				40.0		70.0		40.0		40.0		40.0	%
	+SR		77	6/ 7/	10.0		4.0		25.0		25.0		50.0 (05 only) 100.0 (06 only)		100.0 (07 only) 45.0 (08 only)		V/µs
	-SR		78	6/ 7/	10.0		4.0		25.0		25.0		50.0 (05 only) 100.0 (06 only)		100.0 (07 only) 45.0 (08 only)		V/µs
8 $T_A = +125°C$	TR(tr)		79	6/ 8/				70.0		60.0		60.0		60.0 (05 only) 55.0 (06 only)		55.0 (07 only) 60.0 (08 only)	ns
	TR(tf)		80	6/ 8/				70.0		60.0		60.0		60.0 (05 only) 55.0 (06 only)		55.0 (07 only) 60.0 (08 only)	ns
	TR(+OS)		81	6/ 9/				50.0		70.0		50.0		50.0 (05 only) 45.0 (06 only)		45.0 (07 only) 50.0 (08 only)	%
	TR(-OS)		82	6/ 9/				50.0		70.0		50.0		50.0 (05 only) 45.0 (06 only)		45.0 (07 only) 50.0 (08 only)	%

See footnotes at end of table.

TABLE III. Group A inspection - Continued.

Subgroup	Symbol	MIL-STD-883 method	Test no.	Conditions $\pm V_{CC}$ = ±15 V, see figure 6, unless otherwise specified	Device type 01 limits		Device type 02 limits		Device type 03 limits		Device type 04 limits		Device types 05 and 06 limits		Device types 07 and 08 limits		Unit
					Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
8 T_A = +125°C	+SR	4002	83	6/ 10/	8.0		3.0		20.0		20.0		45.0 (05 only) 84.0 (06 only)		80.0 (07 only) 40.0 (08 only)		V/µs
	-SR		84	6/ 10/	8.0		3.0		20.0		20.0		45.0 (05 only) 84.0 (06 only)		80.0 (07 only) 40.0 (08 only)		V/µs
8 T_A = -55°C	TR(tr)		85	6/ 11/				70.0		60.0		60.0		55.0		55.0 (07 only) 60.0 (08 only)	ns
	TR(tf)		86	6/ 11/				70.0		60.0		60.0		55.0		55.0 (07 only) 60.0 (08 only)	ns
	TR(+OS)		87	12/				50.0		70.0		50.0		45.0		45.0 (07 only) 50.0 (08 only)	%
	TR(-OS)		88	12/				50.0		70.0		50.0		45.0		45.0 (07 only) 50.0 (08 only)	%
	+SR		89	6/ 13/	8.0		3.0		20.0		20.0		45.0 (05 only) 84.0 (06 only)		84.0 (07 only) 40 (08 only)		V/µs
	-SR		90	6/ 13/	8.0		3.0		20.0		20.0		45.0 (05 only) 84.0 (06 only)		84.0 (07 only) 40 (08 only)		V/µs
12 T_A = +25°C	$+t_s$		91	See figure 6				4.0		3.0		1.2		14/		14/	µs
	$-t_s$		92	See figure 6				4.0		3.0		1.2		14/		14/	µs
13 T_A = +125°C	$\Delta V_{IO}/\Delta T$		93	$\Delta V_{IO}/\Delta T$ = V_{IO} (test 19) - V_{IO} (test 1) x 10 15/	-15.0	15.0	-15.0	15.0	-15.0	15.0	-30.0	30.0	-30.0	30.0	-10	+10	µV/°C
	$\Delta I_{IO}/\Delta T$		94	$\Delta I_{IO}/\Delta T$ = I_{IO} (test 22) - I_{IO} (test 4) x 10 15/	-100.0	100.0	-100.0	100.0	-100.0	100.0	-400.0	400.0	-400.0	400.0	-20	+20	pA/°C
13 T_A = -55°C	$\Delta V_{IO}/\Delta T$		95	$\Delta V_{IO}/\Delta T$ = V_{IO} (test 37) - V_{IO} (test 1) x 12.5 15/	-15.0	15.0	-15.0	15.0	-15.0	15.0	-30.0	30.0	-30.0	30.0	-10	+10	µV/°C
	$\Delta I_{IO}/\Delta T$		96	$\Delta I_{IO}/\Delta T$ = I_{IO} (test 40) - I_{IO} (test 4) x 12.5 15/	-200.0	200.0	-100.0	100.0	-100.0	100.0	-400.0	400.0	-400.0	400.0	-20	+20	pA/°C

1/ V_{CM} is achieved by algebraically subtracting the common mode voltage from each supply and algebraically adding the common mode voltage to V (i.e., for V_{CM} = -10 V, $+V_{CC}$ = 25 V, $-V_{CC}$ = -5 V, V = 10 V).

2/ Using the ac test circuit, the $+V_{IO(ADJ)}$ will force the output voltage to a voltage greater than +1 mV. The $-V_{IO(ADJ)}$ will force the output voltage to voltage less than -1 mV.

3/ The $V_{IO(ADJ)}$ test will be performed as follows: The tester will measure V_{IO} and make a determination as to whether V_{IO} is positive or negative. If V_{IO} is positive, the tester will check for $V_{IO(ADJ)}$ to 1 mV more negative than zero volts. If V_{IO} is negative, the tester will check for $V_{IO(ADJ)}$ to 1 mV more positive than zero volts. The limits specified in this table indicate the minimum adjustability required for a device having V_{IO} equal to the max/min limit.

4/ $\pm I_{IB}$ (test numbers 43 through 48), device type 07 is not tested.

5/ Device types 01, 04, 05, 06, 07, and 08: I_{OUT} = ±5 mA. Device types 02 and 03: I_{OUT} = ±10 mA.

6/ Device types 01 and 03: A_V = 5; device types 02, 04, and 05: A_V = 1; device types 06 and 07: A_V = 3.

7/ At +25°C, tests 77 and 78, +SR and -SR, device type 05: 50 V/µs minimum.

8/ At +125°C, tests 79 and 80, $TR_{(tr)}$ and $TR_{(tf)}$, device type 05: 60 ns maximum.

9/ At +125°C, tests 81 and 82, $TR_{(+OS)}$ and $TR_{(-OS)}$, device type 05: +50.0% maximum.

10/ At +125°C, tests 83 and 84, +SR and -SR, device type 05: +45.0 V/µs minimum.

11/ At -55°C, tests 85 and 86, $TR_{(tr)}$ and $TR_{(tf)}$, device type 05: +60.0 ns maximum.

12/ At -55°C, tests 87 and 88, $TR_{(+OS)}$ and $TR_{(-OS)}$, device type 05: +50.0% maximum.

13/ At -55°C, tests 89 and 90, +SR and -SR, device type 05: +45.0 V/µs minimum.

14/ At +25°C, tests 91 and 92, $+t_s$ and $-t_s$, device type 05: 1.0 µs maximum, device type 06, 07, and 08: 1.1 µs maximum.

15/ Tests 93 through 96, which require a read and record measurement plus a calculation, may be omitted except when subgroup 13 is being accomplished for group A sampling inspection and group B (class S) inspection.

TABLE IV. Group C end-point electrical parameters. 1/ 2/

(T_A = +25°C, V_{CC} = ±15.0 V, V_{CM} = 0 V)

Device type	V_{IO} (test no. 1, table III) (mV)				$+I_{IB}$ (test no. 7, table III) (nA)				$-I_{IB}$ (test no. 10, table III) (nA)			
	Limit		Delta		Limit		Delta		Limit		Delta	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
01	-3.0	+3.0	-0.5	+0.5	-20.0	+20.0	-10.0	+10.0	-20.0	+20.0	-10.0	+10.0
02	-4.0	+4.0	-0.5	+0.5	-10.0	+10.0	-8.0	+8.0	-10.0	+10.0	-8.0	+8.0
03	-4.0	+4.0	-0.5	+0.5	-15.0	+15.0	-10.0	+10.0	-15.0	+15.0	-10.0	+10.0
04	-5.0	+5.0	-1.5	+1.5	+1.0	+200.0	-20.0	+20.0	+1.0	+200.0	-20.0	+20.0
05,06	-8.0	+8.0	-1.5	+1.5	+1.0	+200.0	-20.0	+20.0	+1.0	+200.0	-20.0	+20.0
07,08	-1.5	+1.5	-0.5	+0.5	-1.0	+1.0	-0.5	+0.5	-1.0	+1.0	-0.5	+0.5

1/ Delta limits apply to the measured value (see delta limit definition in MIL-M-38510).
2/ Each of the parameters shall be recorded before and after the required burn-in or life tests to determine deltas (Δ).

5. PACKAGING

5.1 Packaging requirements. The requirements for packaging shall be in accordance with MIL-M-38510.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Microcircuits conforming to this specification are intended for original equipment design applications and logistic support of existing equipment.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of the specification.

b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).

c. Part or Identifying Number (PIN) (see 6.6).

d. Requirements for delivery of one copy of the quality conformance inspection data pertinent to the device inspection lot to be supplied with each shipment by the device manufacturer, if applicable.

e. Requirements for certificate of compliance, if applicable.

f. Requirements for notification of change of product or process to acquiring activity in addition to notification to the qualifying activity, if applicable.

g. Requirements for failure analysis (including required test condition of method 5003 of MIL-STD-883), corrective action, and reporting of results, if applicable.

h. Requirements for product assurance options.

i. Requirements for special lead lengths or lead forming, if applicable. These requirements shall not affect the PIN.

j. Requirements for "JAN" marking.

6.3 Abbreviations, symbols, and definitions. The abbreviations, symbols, and definitions used herein are defined in MIL-M-38510 and MIL-STD-1331.

6.4 Logistic support. Lead materials and finishes (see 3.3) are interchangeable. Unless otherwise specified, microcircuits acquired for Government logistic support will be acquired to device class B (see 1.2.2) and lead material and finish C (see 3.3). Longer length leads and lead forming shall not affect the PIN.

6.5 Substitutability. The cross-reference information below is presented for the convenience of users. Microcircuits covered by this specification will functionally replace the listed generic-industry type. Generic-industry microcircuit types may not have equivalent operational performance characteristics across military temperature ranges or reliability factors equivalent to MIL-M-38510 device types and may have slight physical variations in relation to case size. The presence of this information shall not be deemed as permitting substitution of generic-industry types for MIL-M-38510 types or as a waiver of any of the provisions of MIL-M-38510.

Military-device type	Generic-industry type
01	2700
02	2600
03	2620
04	2500
05	2510
06	2520
07	OP44
08	OP42

6.6 Part or Identifying Number (PIN). The PIN shall be in accordance with MIL-M-38510.

6.7 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

CONCLUDING MATERIAL

Custodians:
Army - ER
Navy - EC
Air Force - 17
NASA - NA

Review activities:
Army - AR, AV, MI
Navy - OS, SH
Air Force - 11, 17, 19, 85, 99
DLA - ES

User activities:
Army - SM
Navy - AS, CG, MC

Preparing activity:
NASA - NA

Agent:
DLA - ES

(Project 5962-1183)